

Software:
mind over machine in the
Intelligent Universe

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Northern Telecom Limited

Northern Telecom Limited is the principal supplier of telecommunications equipment in Canada and the second largest in North America. It is also a significant manufacturer of multifunction terminal systems and other computer-related equipment. It operates 27 manufacturing plants in Canada, 22 in the United States, two in the Republic of Ireland and one each in Brazil, England, Malaysia and Turkey. Bell-Northern Research Ltd., a subsidiary, with six research facilities in Canada and one in the U.S., is the largest industrial research organization in Canada.

Version française

Si vous désirez une version française de ce rapport, veuillez en faire la demande au service des Relations de l'entreprise

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Canada L5A 3A2

Versión española

Puede obtenerse la versión española de este informe solicitándola al Corporate Relations Department Northern Telecom Limited
P.O. Box 458, Station A
Mississauga, Ontario
Canada L5A 3A2

Listing of stock

Montreal Stock Exchange
New York Stock Exchange
The Toronto Stock Exchange
Vancouver Stock Exchange
Stock Symbols
NT on NYSE
NTL on Montreal, Toronto and Vancouver exchanges

Transfer offices

Company offices
1050 Beaver Hall Hill, Montreal
393 University Avenue, Toronto
Montreal Trust Company
Halifax, Winnipeg, Regina,
Calgary, Vancouver
Manufacturers Hanover Trust Company
New York, N.Y.
Continental Illinois National Bank and Trust Company of Chicago
Chicago, Ill.

Registrars

Montreal Trust Company
Halifax, Montreal, Toronto,
Winnipeg, Regina, Calgary,
Vancouver
Manufacturers Hanover Trust Company
New York, N.Y.
Continental Illinois National Bank and Trust Company of Chicago
Chicago, Ill.

Annual meeting

The annual meeting of shareholders will take place at 11 a.m., Tuesday, April 22, 1980 in the Four Seasons Hotel, Edmonton, Alberta.

Form 10K

The Form 10K annual report for 1979 as filed by the company with the Securities and Exchange Commission in Washington, D.C. is available to shareholders without charge upon request to Roy T. Cottier, vice-president, corporate relations.

Trademarks

The product names CALRS, Contempra, Digital World, DMS, Intelligent Universe, Protel, Pulse, SL, and SM, used in this report are trademarks of Northern Telecom Limited.

Dividend Reinvestment and Stock Purchase Plan

Shareholders can now take advantage of a convenient and cost-free plan to purchase additional shares of Northern Telecom Limited. Quarterly dividends can be invested automatically to purchase additional shares, or fractions of shares, at a discount from the average market price (calculated during a fixed period each quarter). Shares can also be purchased by voluntary cash payments, of as little as \$50 to a maximum of \$5,000, during a quarter. In either case, there are no brokerage fees or other service charges. Additional information on the plan may be obtained from:

*The Treasurer
Northern Telecom Limited
P.O. Box 6121, Station A
Montreal, Quebec
Canada H3C 3A7*

With the compliments of

Roy T. Cottier

Vice-president, corporate relations
Northern Telecom Limited
Mississauga, Ontario
Canada

No acknowledgement necessary

Northern Telecom Limited

1600 Dorchester Blvd. West
Montreal, Quebec H3H 1R1

Report to shareholders

The persistent weakness in the Canadian economy continues to adversely affect our business here. However, gains recorded by our established operations outside of Canada, and contributions made by recent acquisitions, offset the declines in sales and earnings of our Canadian manufacturing and distribution companies.

Consolidated sales for the second quarter of 1978 were \$366.4 million, compared with \$342.4 million in the second quarter of 1977. Consolidated net earnings before extraordinary gains were \$24.9 million in the second quarter of 1978, compared with \$24.2 million in the period last year. Based on an increased average number of shares outstanding in the 1978 period, earnings per share were \$0.90, compared with \$0.91 in the 1977 quarter.

Consolidated net earnings after an extraordinary gain in the second quarter of 1978 of \$2.4 million (\$0.09 per share) were \$27.3 million (\$0.99 per share), compared with \$24.8 million (\$0.93 per share) after an extraordinary gain of \$0.6 million (\$0.02 per share) in the 1977 period. The extraordinary gains are principally from a reduction of income taxes arising from the use of a subsidiary's prior years' tax losses.

For the first half of 1978, consolidated sales rose to \$676.3 million from \$649.9 million in the first six months of 1977. Consolidated net earnings before extraordinary gains were \$43.7 million in the first half of 1978, compared with \$43.9 million in the comparable 1977 period. Based on an increased average number of shares outstanding, earnings per share were \$1.61 in the first half of 1978, compared with \$1.66 in 1977.

Consolidated net earnings for the first six months in 1978 after an extraordinary gain of \$4.7 million (\$0.18 per share) were \$48.4 million (\$1.79 per share) compared with \$45.1 million (\$1.70 per share) in the first half of 1977 after an extraordinary gain of \$1.2 million (\$0.04 per share). The extraordinary gains are principally from a reduction of income taxes arising from the use of a subsidiary's prior years' tax losses.

The increase in the extraordinary gains in 1978 compared with 1977 reflects a change in Canadian income tax laws approved in December 1977, permitting the transfer of tax losses to the parent company. The benefit of these tax losses is being fully realized in equal installments this year.

The results for the second quarter and first half of 1978 include the favorable effects of an additional tax deductible research and development allowance included in the 1978 Canadian federal budget. Net R&D expenses in the first half were \$42.7 million, up from the \$36.9 million spent in the first six months last year.

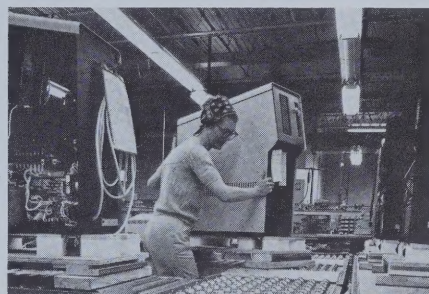
R&D tax credits and the effects of non-taxable income principally from our equity interests in Intersil, Inc. and DATA 100 Corporation, combined about equally to reduce

the corporation's effective income tax rate for the second quarter 1978 to 35.2 percent compared with 41.0 percent in the 1977 period. For the first six months of 1978 the effective tax rate was 36.9 percent compared with 40.6 percent in the first half of 1977.

The benefits of our drive to expand our business outside of Canada, through internal growth and acquisitions, were evident in the first six months this year. Northern Telecom's most rapid growth was in the U.S. where sales and earnings are ahead of last year.

The results of the second quarter and first half of 1978 reflect the acquisitions of Danray, Inc. on January 5, 1978 and Sycor, Inc. on May 26, 1978. These companies contributed about \$24 million to our consolidated sales in the first half.

Nashville, Tennessee-based Northern Telecom, Inc. reported sizable increases in sales for the first half. Sales



Processor for Sycor's Model 440 clustered terminal processing system is moved along assembly line at the company's Ann Arbor, Michigan plant.

of the business communications systems group were up about 23 percent and Cook Electric Company, acquired in December 1976, recorded a 26 percent gain in sales. The advanced telephone products group recorded a 16 percent sales increase. The introduction of the DMS-10*, the small digital local switching system, is going very well. 14 DMS-10s were in service by the end of July. Four more were turned over to customers to be put in service in August. Northern Telecom has sold, has orders or firm commitments for about 110 DMS-10s.

Sales outside of Canada amounted to about \$190 million, or 28 percent of total consolidated sales in the first half, compared with 23.6 percent for all of 1977, and will amount to a still higher proportion by year-end 1978 due to the growth of NTI, Danray, Sycor and DATA 100 and exports from Canada.

Northern Telecom began a tender offer on July 17 to acquire all the common shares of DATA 100 Corporation that it did not already own. The offer was US\$20 per DATA 100 share. An offer was also made for all outstanding convertible debentures, preferred shares and stock purchase warrants. Northern Telecom's initial investment in DATA 100 was made on November 30, 1977, when we purchased one million shares at US\$15 per share.

The tender offer ended on August 4, at which time Northern Telecom owned, on a fully diluted basis, about 87 percent of the total equity of DATA 100. We now intend to complete a merger with DATA 100, thus making it a wholly-owned subsidiary.

DATA 100, based in Minneapolis, Minnesota, designs, manufactures, markets and services multifunction computer terminal systems which communicate with central computers via telephone lines. The company also produces a



DATA 100's Model 82 remote display system, introduced in 1977, provides on-line interactive communications with remote central computers.

* Trademark of Northern Telecom Limited

Interim condensed consolidated statement of earnings

	(thousands of dollars) Three months ended June 30		(thousands of dollars) Six months ended June 30	
	1978	1977**	1978	1977**
Sales	\$366,381	\$342,416	\$676,312	\$649,909
Cost of sales and operating expenses	325,161	301,020	605,185	578,163
Earnings from operations	41,220	41,396	71,127	71,746
Investment and other income (net) less interest charges	(2,197)	438	(75)	3,432
Earnings before underlisted items	39,023	41,834	71,052	75,178
Provision for income taxes	13,517	16,772	25,550	30,062
	25,506	25,062	45,502	45,116
Minority interest in net profit of subsidiary companies	573	887	1,829	1,217
Net earnings before extraordinary item	24,933	24,175	43,673	43,899
Extraordinary item*	2,356	608	4,712	1,186
Net earnings for the period	\$ 27,289	\$ 24,783	\$ 48,385	\$ 45,085
Net earnings per share				
— before extraordinary item	\$0.90	\$0.91	\$1.61	\$1.66
— after extraordinary item	\$0.99	\$0.93	\$1.79	\$1.70
Based on average number of common shares outstanding (thousands)	27,705	26,469	27,087	26,469
Dividend per share	\$0.18	\$0.16	\$0.36	\$0.32

Interim condensed consolidated statement of changes in financial position

Source of funds

Operations:

Net earnings before extraordinary item	\$ 43,673	\$ 43,899
Items not requiring funds		
— depreciation and amortization	18,806	14,587
— deferred income taxes	520	3,967
— other	2,238	1,917
	65,237	64,370
Extraordinary item*	4,712	1,186
Proceeds from sale of plant and equipment	789	405
Proceeds from long-term debt	4,076	502
Proceeds from capital stock	84,574	—
	159,388	66,463

Application of funds

Long-term receivables	4,020	—
Expenditures for plant and equipment	29,112	18,273
Net non-current assets acquired	79,093	—
Reduction of long-term debt	3,623	2,624
Dividends	10,091	8,470
Investment in associated companies	5,365	4,936
Other investments	3,360	—
Other	5,700	1,850
	140,364	36,153
Increase in working capital	19,024	30,310
Working capital at beginning of year	344,595	314,735
Working capital at end of period	\$363,619	\$345,045

* Represents a reduction of income taxes arising from the use of prior years' losses of a subsidiary company.

**Certain comparative figures for the periods ended June 30, 1977 have been reclassified to conform with the presentation adopted in the current period.

broad range of computer peripheral equipment such as line printers and magnetic disk storage devices.

DATA 100's 1977 revenues were US\$138 million and net earnings, after an extraordinary gain, were US\$6.1 million. For the first half of 1978, DATA 100 reported revenues of US\$76.6 million, up 22.9 percent from the 1977 period, and net earnings of US\$2.6 million, about even with the 1977 level.

The merger with Sycor, Inc. was completed on May 26. Northern Telecom issued 3,123,407 shares to Sycor's shareholders in exchange for their common shares of Sycor.

Sycor, based in Ann Arbor, Michigan, was founded in 1967. The company markets and services its products through a network of 38 sales offices and 108 service centers in the U.S. and Canada and through various companies overseas under distribution agreements.

The company has nearly 200,000 square feet of manufacturing space in two plants and employs 2,032 people. For 1977, Sycor reported net earnings of US\$3.2 million on revenues of US\$76.8 million.



Robert C. Scrivener watches Samuel N. Irwin sign the documents completing the merger of Sycor, Inc. with Northern Telecom.

Sycor designs, manufactures and markets stand-alone and clustered intelligent terminal systems and related peripheral equipment for distributed data entry and processing. The peripheral systems include printers, disk storage devices and cassette recorders. More than 40,000 Sycor terminals are in use in some 38 countries.

Samuel N. Irwin, 51, chairman and president of Sycor, has been elected to the board of directors of Northern Telecom Limited. To manage our total electronic office equipment business, we have established Northern Telecom Systems Corporation.

A regular quarterly dividend of \$0.18 per share was declared by the board of directors on May 25, 1978, payable June 30, 1978 to shareholders of record on June 15.

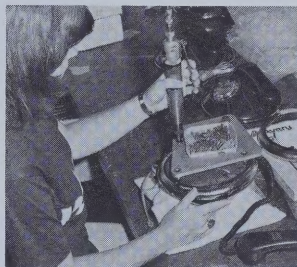
R.C. Scrivener
Chairman and
chief executive officer

W.F. Light
President

August 7, 1978

U.S. growth requires more plant space

Northern Telecom, Inc. is expanding its telephone apparatus plant in Nashville, Tennessee, by leasing an additional 35,000 square feet of space in a building located near its existing 100,000-square-foot plant. The expansion is necessitated by demand in the U.S. for the Contempra* and the new distinctively stylish Imagination* telephones, Dawn*, Doodle*, Kangaroo* and Alexander Graham Plane*. Additional space will also be needed for production of Northern Telecom's new electronic telephones to be introduced in 1979.



Assembly of Dawn telephones at the Nashville, Tenn. plant.

NTI has completed doubling the size of its printed circuit board production plant in West Palm Beach, Florida to 94,500 square feet. Construction is also nearly completed on a new 135,000-square-foot business communications systems plant in Santa Clara, California. NTI expects to begin moving operations from the present Mountain View buildings to the new plant in late September.

The expansion of NTI's Danray division Dallas, Texas plant by 30,000 square feet to a total of 90,000 square feet is expected to be finished in mid-November.

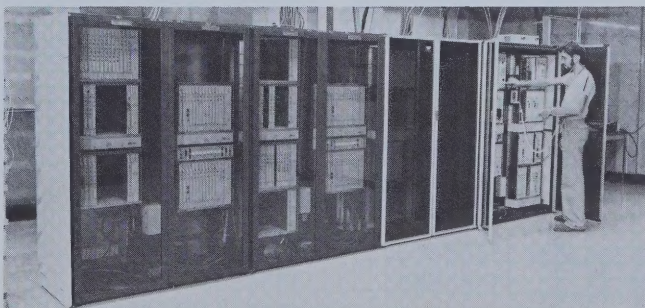
Construction has begun on an 84,000-square-foot research and development facility in Ann Arbor, Michigan, for Sycor, Inc. Sycor expects the new building to be ready for occupancy by May 1979.

First SL-10 sale overseas

An aggressive international marketing effort has resulted in the first sale of an SL-10* data packet switching system outside of Canada. Northern Telecom International Limited has received an order worth about \$600,000 from the Deutsche Bundespost, West Germany's telecommunications authority, for an SL-10 to be used as a pilot node, or switching center, in a Berlin data network to be in operation in January next year.

Under the contract, Northern Telecom will supply and install the system, maintain it for one year, provide project planning and management, and train Bundespost personnel to install, operate and maintain the system.

The SL-10 is produced at Northern Telecom Canada's Belleville, Ontario plant. It was designed and developed by Bell-Northern Research Ltd. in cooperation with Northern Telecom and Bell Canada. Northern Telecom's effort to market the SL-10 outside of Canada is aided by its ability to demonstrate that the system has proven its capability



An SL-10 switch in service in Ottawa in the Datapac system.

during more than a year of service in Canada. On June 15, 1977, Bell Canada and the Trans Canada Telephone System inaugurated commercial service of its Datapac packet switched digital data network, using the SL-10 as the backbone of the network.

Datapac was designed to be for data communications what the telephone network is for voice. It is a universally shared network capable of connecting a distributed set of data terminals to a computer, or it can create a single common network for a multitude of computers and terminals.

Traditionally, data has been sent over dedicated circuits or multiplex between terminals, a costly method.

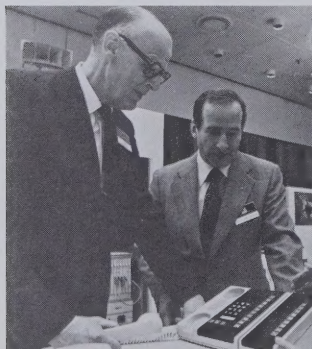
Packet switching, like the Datapac system, does not require lines for any particular call. Instead, data is bundled and sent through the system in units, or packets, with an address telling the switch where to send it. The packet is transmitted from a subscriber's computer terminal to an SL-10 node and is then interleaved with other packets and transmitted to the SL-10 network node nearest to its final destination. It is then transmitted to the subscriber to which it is addressed. Users pay only for the actual transmission time used for their packet.

SL-10s are now in operation in six major Canadian cities and more are being added.

Beneteau, president of NTC

Basil A. Beneteau, 52, has been appointed president and chief executive officer of Northern Telecom Canada Limited. Mr. Beneteau, formerly executive vice-president, marketing for Northern Telecom Limited and chairman of Northern Telecom International Limited, succeeds Charles G. Millar. Mr. Millar, 51, has been appointed executive vice-president, operations for Northern Telecom Limited, responsible for coordinating our global manufacturing operations, which consist of 52 plants in seven countries.

Northern Telecom Canada is Northern Telecom's largest operating subsidiary with sales of nearly \$900 million in 1977, including \$91 million of exports. It has 25 plants in nine Canadian provinces and more than 14,700 employees.



J. Rosbaek, administrative director, Copenhagen Telephones, (left) and Basil A. Beneteau, examine an SL-1* telephone set at Northern Telecom's first European digital seminar.



Charles G. Millar (left) and the Hon. Wilfred G. Bishop, New Brunswick's minister of transportation, watch a telephone set being tested at the repair and overhaul plant in Saint John, N.B.

nt northern
telecom

AR18

Interim
report

second quarter
1978

6,685

3,499

80,802

191,678

nt northern
telecom

Northern Telecom
Limited

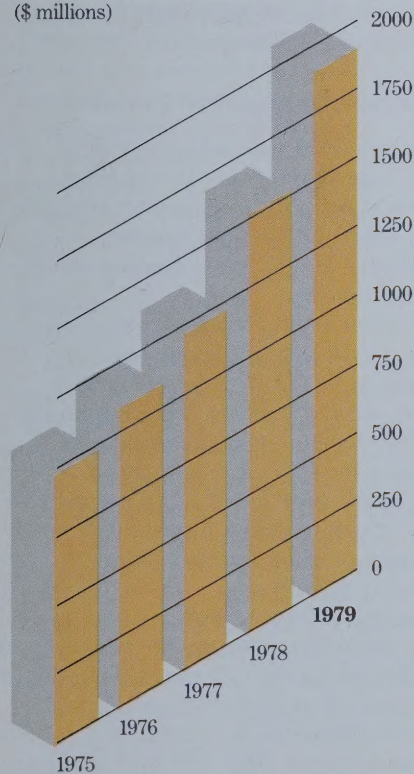
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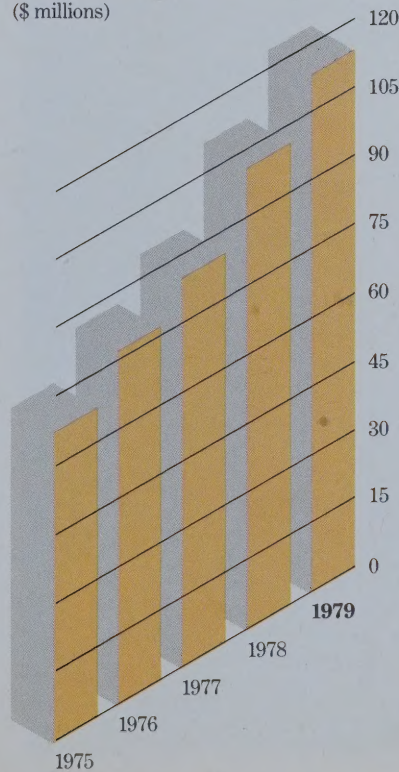
Financial highlights

	1979	1978
Sales	\$1,900,522,000	\$1,504,560,000
Net earnings.....	113,472,000	100,728,000
Net earnings per share	3.70	3.55
Dividends per share	0.85	0.74
Shareholders' equity	917,615,000	632,566,000
Working capital	556,925,000	367,273,000
Capital expenditures	173,536,000	127,228,000
Shares outstanding (at Dec. 31).....	33,592,901	29,592,901
Shares outstanding (average during year).....	30,655,915	28,343,538
Shareholders	8,039	7,432
Employees	33,301	31,756

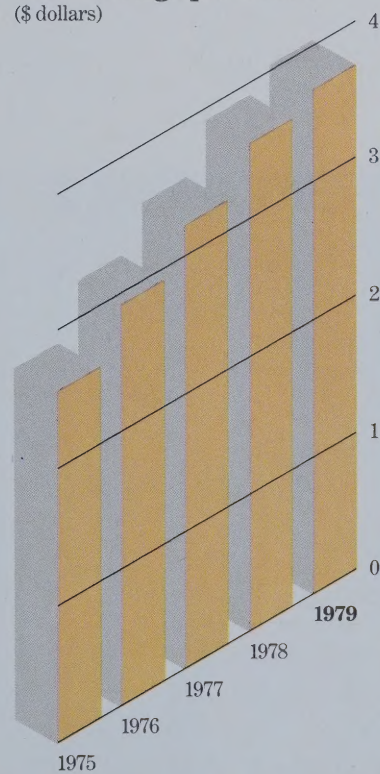
Consolidated sales
(\$ millions)



Net earnings
(\$ millions)



Net earnings per share
(\$ dollars)



Report to shareholders

Substantial growth in the United States and overseas markets and a strong performance by our operations in Canada in 1979, resulted in our seventh successive year of record consolidated sales and net earnings.

Consolidated sales rose 26.3 percent to \$1.901 billion, from \$1.505 billion in 1978. Net earnings were up 20.2 percent to \$113.5 million, compared with \$94.4 million earned in 1978 (before extraordinary gain of \$6.3 million). Earnings per share in 1979, based on an increased average number of shares outstanding, were \$3.70, compared with \$3.33 per share in 1978 (before the extraordinary gain amounting to \$0.22 per share).

A detailed discussion of our financial results can be found in the *Financial review*, beginning on page 23.

Sales growth in all markets

While sales continued to grow in Canada where we maintained our market position, the increase in markets outside of Canada was much more substantial. In 1979, sales in the U.S. and overseas markets exceeded sales in Canada for the first time.

Sales in Canada accounted for 49.7 percent of total sales; sales in the U.S. were 39.7 percent of the total, and sales outside of North America were 10.6 percent. Comparable figures in 1978 were 59.2 percent of total manufacturing sales made in Canada, 32.1 percent in the U.S., and 8.7 percent outside North America.

Our Digital World switching and transmission systems have won swift and broad acceptance in the U.S. This is reflected in the change that has taken place in the geographic distribution of the sales of telecommunications products. Telecommunications products, systems and services were \$1.505 billion, or 79.2 percent of Northern Telecom's revenues in 1979.

Sales of telecommunications equipment in Canada were higher but declined as a percentage of the total to 58.5 percent in 1979, compared with 67.3 percent in 1978. In the U.S., telecommunications sales increased to 35.5 percent of the total, compared with 27.5 percent in 1978. Sales outside North America were six percent, compared with 5.2 percent in 1978.

Sales of electronic office systems, the products of Northern Telecom Systems Corporation (NTSC), formed in 1978 following the acquisitions of Sycor, Inc. and Data 100 Corporation, were \$349.8 million in 1979, or 18.4 percent of our consolidated sales. Other sales were principally contract research and development.

Good performance in Canada

Northern Telecom Canada Limited (NTC) increased sales and earnings. This was a highly satisfactory achievement in the light of the number of challenges met by its management during the year.

In a continuing weak economic climate, Canadian telephone company capital spending rose to about \$2.1 billion, up 9.4 percent, about equal to the estimated average annual rate of inflation for 1979. Despite this, significant sales gains were recorded by NTC for telephone apparatus, business communications systems, and wire and cable.

Revenues from telephone central office switching systems continued to be affected by the transition from the older analog to the advanced digital systems. Demand in Canada is greatest for the DMS-100 Family, the larger members of our Digital Multiplex Systems (DMS) line, to meet growth and modernization requirements. The first of these large local, toll and local/toll switches was put in service in 1979. However, production of the DMS-100 Family, the successors to the analog stored-program-controlled SP-1, in early 1980, is still in the start-up mode.

Following the expiration of all of its existing labor agreements during the year, NTC negotiated new three-year labor agreements involving 11 unions and nearly 12,000 employees across Canada. There were no major work stoppages during the negotiations.

A major strike at Bell Canada, NTC's largest customer, in late July, August and September, affected Bell Canada's ability to install equipment during the third quarter. However, the strike had no significant impact on NTC's operations for the year.

Sales to Bell Canada rose in 1979 to \$652.4 million, compared with \$571.2 million in 1978. Reflecting the sales increases made in other markets, sales to Bell Canada again declined as a percentage of consolidated sales to 34.3 percent, compared with 38 percent last year. In 1975, five years ago, Bell Canada accounted for 45.3 percent of Northern Telecom's total sales.

Productivity improvement and cost reduction programs were again key elements in NTC's successful year. They once more exceeded objectives (based on a percentage reduction of the budgeted cost of sales), achieving a 10.5 percent cost reduction.

Throughout the 1970s NTC held its net price increases to well below the rate of increase of the Canadian Consumer Price and Wholesale Price indices. Net price increases (increases less price reductions) last year averaged only 6.1 percent.

NTC increased exports of systems, parts, components and services to customers outside of Canada, including Northern Telecom's plants in the U.S., Turkey and Republic of Ireland. Exports amounted to \$227.8 million in 1979, or about 20 percent of NTC's sales, compared with \$146.1 million in 1978 when they were 15.7 percent of total manufacturing sales. Export sales support an estimated 2,500 jobs in Northern Telecom's Canadian operations and additional jobs in Canadian companies which supply NTC.

International markets

Sales of telecommunications products outside of North America also increased. A wide range of telecommunications products were sold to, or ordered by, customers in 70 countries.

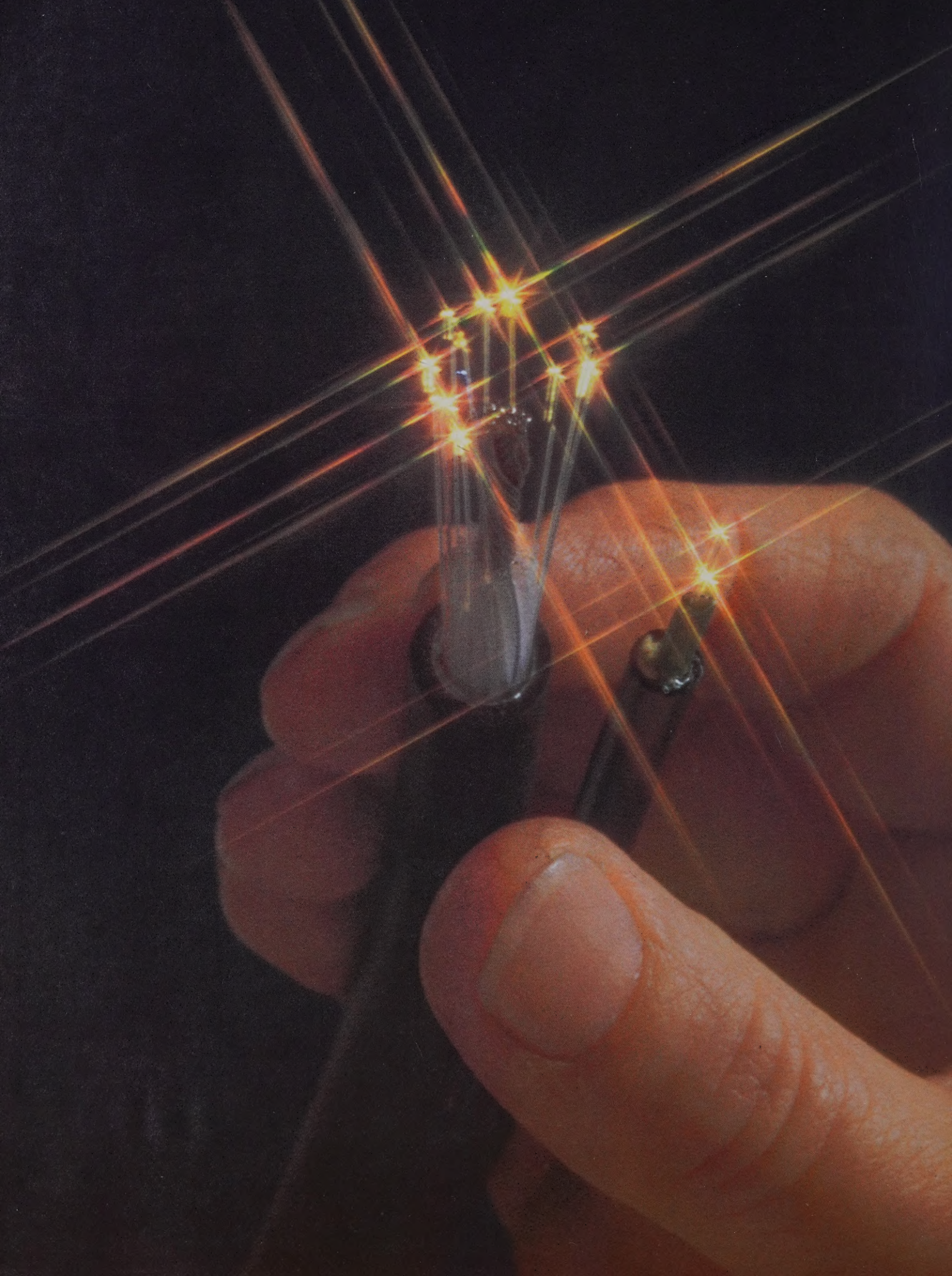
To cite a few examples: the stylish Contempra telephone which has been sold in 44 countries, was sold to Hong Kong Telephone Company; crossbar central office telephone switching was ordered by Greece; SL-1s were sold in or ordered by six countries in the Middle East, including two 3,900-line systems for Saudi Arabia, and 18 to be installed in Iraq, along with 50 SM-1 key telephone systems; a DMS-100 was ordered by Grand Bahamas Telephone Company; nine SL-1s were ordered by Jutland Telephones in Denmark, and Barbados became the first country outside of North America to order the full DMS line, including 10 DMS-1 subscriber carrier systems, three DMS-10 small local switches, and one DMS-100 Family switch.

In December, South Korea announced that Northern Telecom International Limited was the successful bidder for a three-year contract to supply digital transmission equipment to that country. The contract could be worth as much as \$90 million and represents one of the largest individual export sales ever made by Northern Telecom. Equipment for South Korea will be manufactured at NTC's Aylmer, Quebec and Winnipeg, Manitoba plants.

In 1979, Northern Telecom International and the Deutsche Bundespost signed a contract for the delivery of 26 SL-10s. This order followed the sale of a SL-10 data packet switching system to the Deutsche Bundespost, West Germany's telecommunications authority, in 1978.



*A. Jean de Grandpré (left)
and Walter F. Light.*



Three SL-10s were sold to the Société Générale de Banque, Belgium's largest bank. They have been installed in Brussels, Ghent and Antwerp, providing the bank with its own data packet switching network.

About 34 percent of NTSC revenues from its multifunction data terminal systems and related computer equipment were made in 35 countries outside of North America.

NTSC's first full year

Northern Telecom Systems Corporation completed its first full year of operations in 1979. NTSC was formed to play a key role in Northern Telecom's plans to be a recognized leader in the 1980s as a designer, manufacturer and supplier of the sophisticated integrated information systems which will be a part of what we call the Intelligent Universe.

Every day new applications of computing power for the office and home are being conceived. Increasingly these information systems are being joined together by complex electronic international communications networks. These networks are making it possible to provide people around the world with easy access to virtually unlimited information. This emerging global information network of communications systems and input/output devices such as computers, data terminals, word processing, graphics systems, facsimile and telephones, is the Intelligent Universe.

Software: mind over machine in the Intelligent Universe, which begins on page 15, discusses some of Northern Telecom's activities and expectations in this area.

NTSC revenues in 1979 were marginally higher than in 1978. While its operations were profitable, NTSC's earnings were lower than the previous year.

Fiber optics, which transmit voice and data in the form of light impulses, will eventually replace the copper wiring of the world's telecommunications networks. These hair-thin glass fibers, developed at Bell-Northern Research in Ottawa, Ontario, have a transmission capacity of more than 12,000 messages simultaneously.

The cost of effectively integrating two distinct companies, Sycor and Data 100, was, and continues to be, higher than we anticipated. NTSC's profitability also was adversely affected by a widespread and growing trend in the computer industry toward customer leasing rather than outright purchase of equipment, thereby spreading earnings over several years.

The initial phase of integration of the two companies was completed in 1979. NTSC sales and services people can now meet their customers' needs with a full product line of multifunction data terminals and related equipment. In 1979 we began the implementation of a plan to rationalize and restructure NTSC manufacturing operations. We established service and distributor groups.

In 1980, we will be focusing attention on R&D programs to develop integrated business systems compatible with Northern Telecom's strategies and existing R&D programs for the Intelligent Universe. Fundamental is our decision that at the hub of our future office information networks will be PBXs, or business communications systems such as the SL-1. These will act as the control center for all manner of other information terminals, such as NTSC's Model 445 distributed data processing system.

The development of integrated office information networks is, in many respects, an evolutionary process making it possible for our customers to readily expand the feature capabilities of their already installed Northern Telecom systems such as the SL-1 or Model 445.

For example, a new data feature was introduced in 1979 for the SL-1. The Add-On Data Module permits data signals to be sent digitally at rates up to 9,600 baud (a technical term referring to the speed of a unit of digital transmission) between computers and terminals with the PBX acting as the control. This obviates the need for multiple conversions of signals to analog and back again to digital as has been done in the past with jeopardy to the quality of the data signal. Data and voice transmission may be sent simultaneously over the same lines, reducing the expense

of office wiring, and SL-1's many features become available for data transmission. This data feature may be added to any SL-1 with only the addition of a special line card and the data module to a telephone set.

The installed SL-1s and Model 445s represent a substantial customer base with which we can work. At the end of 1979, 1,705 SL-1s had been sold or were on order in 23 countries. These include 1,078 SL-1s in the U.S., 447 in Canada and 180 overseas. There were more than 700 Model 445 systems installed in 12 countries.

In line with the concept of business communications systems, such as the SL-1, being the focal point for the office information networks of the future, we completed by year-end a realignment of our U.S. operations. The Business Communications Group, responsible for such products as the SL-1 and Pulse PBX, was made a part of NTSC. NTSC is now responsible for the sale of all products to business and other institutions.

The NTSC organization has 7,870 employees in 10 plants and 352 sales and service offices in the U.S. and 13 other countries.

NTI signs supply agreements

Northern Telecom, Inc. is responsible for serving the needs of the common and specialized common telecommunications carriers in the U.S. It substantially increased sales and earnings last year.

The major story for NTI was DMS. A few of the DMS milestones marked by NTI in 1979 were:

- American Telephone & Telegraph (AT&T) recommended the DMS-10 to its operating telephone companies, which serve about 80 percent of the more than 170 million telephones in the U.S. (By comparison, there are about 15 million telephones installed in Canada.) The AT&T operating companies have been advised to include the DMS-10 in their application studies for community dial offices (CDO) for replacements and new systems up to 4,000 lines. There are about 4,800 CDOs in the AT&T system.



A three-year contract committing NTI to supply DMS-10 to the AT&T system was signed by AT&T and Northern Telecom in February, 1980. AT&T's recommendation was the result of a 1978 study by AT&T of digital CDOs manufactured by a number of companies. The study concluded that the DMS-10 offered the best potential opportunity for application in the AT&T system compared with the other CDOs examined.

The first DMS-10s will be shipped to AT&T operating companies in 1980 for installation and evaluation. The AT&T DMS-10 requirements for 1980 will be met through existing facilities. Northern Telecom is prepared to expand capacity to meet future demands.

- NTI signed two-year DMS supply agreements with Continental Telephone Corporation for US\$50 million, Central Telephone and Utilities (Centel) for US\$50 million, and Mid-Continent Telephone Company for US\$25 million. Continental, Centel and Mid-Continent are, respectively, the fourth, fifth and sixth largest telephone companies in the U.S.

- The 100th DMS-10 was placed in service in September by Northwestern Telephone Company in East Dubuque, Illinois. At year-end there were 141 DMS-10s in service including 126 in the U.S., 11 in Canada and four offshore.

- The first DMS-200 long-distance switch in the U.S., and second in North America, was placed into service in April in Warsaw, Virginia by Continental Telephone of Virginia.

DMS demand takes off

We believe the rapid introduction, acceptance and production build-up of Northern Telecom's DMS line is without precedent in the history of telecommunications in North America. Northern Telecom is the only manufacturer in North America producing a complete line of digital switching systems.

In May 1976, Northern Telecom became the first manufacturer in the world to announce plans and firm introduction dates for a full line of digital switching and transmission systems. The first of these, DMS-1 and DMS-10, were placed in service in 1977. With the placing in service for Bell Canada of the first DMS-100 in December at Ottawa, Ontario, Northern Telecom has met or exceeded by as much as one year each of the announced introduction dates for all DMS products. DMS-10s have been sold to or ordered by telephone companies in 39 states, six Canadian provinces and four other countries.

At year-end 1979, 1,272 DMS systems had been sold or ordered, representing more than 1.8 million equivalent (including long-distance trunks multiplied by five) lines. These include 791 DMS-1s, 365 DMS-10s, and 116 DMS-100 Family consisting of the DMS-100, DMS-200, DMS-100/200 and DMS-300 switches. The 100th DMS-100 Family order was placed in September by Alberta Government Telephones, Edmonton, Alberta.

By comparison, in November 1971, Northern Telecom introduced the SP-1. It became the largest selling stored-program-controlled analog switching system in North America, outside of the AT&T system. In eight years, 213 SP-1s, or 2.9 million equivalent lines have been shipped.

In September, the availability of the newest member of the DMS line, an international version of the DMS-1, was announced. The new DMS-1 meets CEPT (Conférence européenne des postes et télégraphes) and CCITT (Comité consultatif international téléphonique et télégraphique) recommendations.

Plant expansion to meet product demand

Northern Telecom continues to expand manufacturing capacity to meet the demand for our products in Canada and the U.S.

Capital expenditures for plant and equipment in the U.S. and Canada were about equal in 1979. Northern Telecom's investments in Canada in the 1970s totalled more than \$314.3 million. Total capital spending in 1979 of \$173.5 million, included additions to the data terminals lease base.

New plants announced in the U.S. included:

- Following the opening in July of our first U.S. transmission equipment manufacturing plant in Atlanta, Georgia, a 140,000-square-foot facility, a transmission division is being founded in the U.S.

- To meet the demand for DMS switching, a 250,000-square-foot facility is being constructed in Raleigh, North Carolina, and DMS production began in a new 80,000-square-foot plant in Morrisville, North Carolina. Administrative operations for NTI's digital switching operations were moved to a 70,000-square-foot office facility in Raleigh, freeing additional space for DMS manufacturing at the nearby 106,000-square-foot plant in Creedmoor.

- Production capacity for business communications systems and PBXs is being increased with a 70,000-square-foot plant in Santa Clara, California.

- A new 70,000-square-foot plant in Mt. Laurel, New Jersey will enable NTI's Spectron division to manufacture more of its systems used to test and control the quality of data transmission.

- BNR Inc., the U.S. subsidiary of Bell-Northern Research Ltd. (BNR), our R&D subsidiary, has outgrown its facilities in Palo Alto, California. Construction is underway on a new 162,000-square-foot building in nearby Mountain View, California. It is expected to be ready in mid-1980.

- In April, NTSC opened a 85,000-square-foot R&D center at Ann Arbor, Michigan. It also houses a new data center linking all of Northern Telecom's U.S. computing systems.

At the Powell Telephone Company in Tennessee, an operator enters modifications and instructions into the software program of a DMS-10 system.



Among a number of plant investments made in Canada in 1979, the largest was to increase DMS production capacity at our Bramalea, Ontario facility. As well, NTC is adding DMS-100 Family manufacturing capability to its Calgary, Alberta plant.

Reflecting the economic vitality of, and demand for, our products in the western Canadian provinces Northern Telecom Canada has announced a number of additional investments in that area. These will include a new 150,000-square-foot plant in Calgary to produce business telephone products such as key telephone sets, the SM-1 key system with PBX features, and a new electronic key system to be introduced in 1980.

Our first western Canadian R&D facility, will be located in Edmonton, Alberta. It is expected to employ as many as 250 people within five years to do R&D on transmission products, business communications products and systems and fiber optics. The headquarters of NTC's transmission group has been established in new offices in Edmonton. These new Alberta facilities will increase our employment in that province from about 200 now to more than 1,000 in 1983.

During 1979 Northern Telecom announced its first two facilities to manufacture proprietary large scale integrated circuits (LSIs). The first of these is already in production near Ottawa, Ontario. The 105,000-square-foot facility will continue to be responsible for the research, engineering and design of these complex custom circuits, as well as their manufacture. It is expected to produce \$20 million worth of LSIs per year to help meet the Canadian demand for these circuits by Northern Telecom and other companies. This facility represents an investment of more than \$36 million.

The second custom LSI fabrication plant will be located in Rancho Bernardo (near San Diego), California. This 50,000-square-foot plant, a \$32.5 million investment, is expected to be in production by early 1981. Its

production is expected to grow to \$50 million (in 1981 constant dollars) per year by the mid-1980s. These two plants are expected to meet 60-to-70 percent of Northern Telecom's requirements for custom LSIs.

Over the past five years, Northern Telecom has invested more than \$30 million at BNR to develop custom LSIs.

R&D investment continues to rise

A long-term, consistent and growing research and development commitment is vital to our ability to remain in the forefront of the highly-competitive telecommunications and computer industries. We are up against formidable international competition which, in most cases, receives substantial direct government subsidies or other R&D assistance.

To remain a technological leader, Northern Telecom will have to continue to spend about seven percent of sales on R&D. In line with our sales growth, we increased our net R&D expenditures in 1979 to \$132.6 million, a 35.6 percent increase from the \$97.8 million spent in 1978. About one in every eight employees at Northern Telecom is engaged in R&D related work.

It is not often recognized that the R&D effort and expense does not end when a product is introduced. Expenditures over the life of a product, enhancing it with additional features or possibly expanding it into a family of products (as in the case of the SL-1), may exceed several times the cost of bringing it to market. For example, the expenditure on SL-1 development is already more than double that spent up to the time of its introduction at the end of 1975, and will be five times that amount by 1983. Similarly, four times the initial R&D investment will be spent on DMS-10.

Light becomes CEO; de Grandpré chairman

Robert C. Scrivener, 65, chairman and chief executive officer of Northern Telecom since May 1976, relinquished the position of CEO on October 1 and retired as chairman of the board on December 31, 1979. He joined Northern Telecom after resigning his position as chairman and CEO of Bell Canada, a company he served for 39 years. Mr. Scrivener will remain a director and will continue to serve the corporation on special projects.

He was succeeded as chairman by A. Jean de Grandpré, Q.C. Mr. de Grandpré, 58, is chairman of the board and CEO of Bell Canada and will continue to hold those positions.

Effective October 1, Walter F. Light, 56, president, since August 1974, was appointed chief executive officer. Mr. Light joined Northern Telecom after a 25-year career with Bell Canada, where he was executive vice-president, operations, prior to joining Northern Telecom as president.

A number of other senior executive appointments were made during the year. Marcelo A. Gumucio, 40, was named executive vice-president, marketing. He was formerly president of the large storage systems group of Memorex Corporation.

George W. Sullivan, 46, was appointed president and chief executive officer of NTI. Mr. Sullivan has had a 20-year career in the U.S. telecommunications industry, most recently with Rockwell International as president of the commercial telecommunications group and vice-president, advanced planning, electronics operations.

William O. Beers, 65, who retired in 1979 as chairman of the board and chief executive officer of Kraft, Inc., was elected a director. Mr. Beers is also a director of A.O. Smith Corporation, American Airlines, Sears, Roebuck & Co. and United States Steel Corporation.

Share offering sells out

In September 1979, Northern Telecom issued an additional two million common shares through underwriters in the U.S. and Canada. Concurrently, an additional two million shares were sold privately to Bell Canada. Bell Canada now owns about 54.5 percent of the 33,592,901 Northern Telecom common shares outstanding. Reception to the offering was excellent, resulting in an increase in the number of shares sold from the originally announced plan to sell 3.5 million shares. The aggregate net proceeds from the share offering of about \$198 million were used to retire debt.

Inspecting a printed circuit board for the SL-1 business communications system at Belleville, Ontario. At the end of 1979, more than 1700 SL-1s had been sold or were on order in 23 countries around the world.

At its November meeting, the board of directors voted to increase the regular quarterly dividend by 25 percent to \$0.25 per share from \$0.20 per share, beginning with the 1979 fourth quarter payment. This is consistent with our policy of paying 20-to-25 percent of our annual net earnings to our shareholders as a return on their investment in Northern Telecom.

The board also approved the introduction of a shareholder dividend reinvestment and stock purchase plan. Under the plan, shareholders are able to reinvest their quarterly dividends to purchase at a discount newly issued shares of the corporation. The discount will be five percent from the average market price during a fixed period.

Shareholders participating in the plan, regardless of whether they choose to reinvest their dividends, will also be able to purchase shares from the corporation through cash payments of a minimum of \$50 up to a maximum of \$5,000 per quarter. The price of shares will be 100 percent of the average market price determined in the same manner as the dividend reinvestment price.

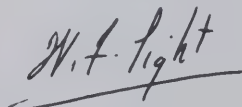
In addition to the price discount for dividend reinvestment, an advantage of the plan is the absence of brokerage fees or service charges for shares purchased through dividend reinvestment or cash payments.

Record backlog indicates continued sales gains

The corporation entered 1980 with an increasing momentum, the best indication of which is that it had the highest order backlog in its history of \$874 million, up 38 percent from \$635.3 million with which it began in 1979. The 1979 backlog does not include the majority of the orders we expect to receive under any of the DMS supply agreements in the U.S.

The high demand for our digital switching and transmission systems has required a build-up in our manufacturing capacity at a rate far exceeding anything in our experience, and is requiring substantial expenditures for bringing on-stream new manufacturing facilities and for training sales and service people. Sales of these systems will grow increasingly profitable following this build-up as we bring our new manufacturing capacity on-stream and as we are able to achieve cost reductions and economies of scale. The costs of this build-up will have an adverse impact on operating earnings in the first and second quarter of 1980.

However, despite inflationary pressures on materials and labor costs, the uncertain economic outlooks throughout the world, we believe the quality and cost-effectiveness of our products, our strategies and our management will bring about continued overall improvement in performance in 1980 and throughout the decade we have just entered.



Walter F. Light
President and
Chief Executive Officer



A. Jean de Grandpré
Chairman of the Board

February 15, 1980

Directors and officers

Directors

David W. Barr
Chairman of the Board
Moore Corporation Limited
Toronto, Ontario

William O. Beers
Former Chairman of the
Board and CEO
Kraft, Inc.
Chicago, Illinois

*A. Jean de Grandpré, Q.C.
Chairman of the Board
Northern Telecom Limited
Chairman of the Board
Bell Canada
Montreal, Quebec

Georges L. Demers, Q.C.
Senior partner
Demers, Gosselin and Robitaille
Quebec City, Quebec

J. Douglas Gibson, O.B.E.
Chairman of the Board
The Consumers' Gas Company
Toronto, Ontario

Donald S. Harvie
Chairman
Devonian Group
Calgary, Alberta

Robert S. Hurlbut
Chairman of the Board
and President
General Foods, Limited
Toronto, Ontario

*Walter F. Light
President and
Chief Executive Officer
Northern Telecom Limited

*Clifford S. Malone
President and
Chief Executive Officer
Canron Inc.
Toronto, Ontario

Vernon O. Marquez
Consultant
St. Lazare, Quebec

*John H. Moore
Chairman of the Board
John Labatt Limited
London, Ontario

William L. Naumann
Former Chairman of the Board
Caterpillar Tractor Co.
Peoria, Illinois

Charles Perrault
President
Perconsult Limited
Montreal, Quebec

*Gérard Plourde
Chairman of the Board and
Chief Executive Officer
U.A.P. Inc.
Montreal, Quebec

*Robert C. Scrivener
Former Chairman of the Board
and Chief Executive Officer
Northern Telecom Limited

*James C. Thackray
President
Bell Canada
Montreal, Quebec

W. Maurice Young
Chairman of the Board and
Chief Executive Officer
Finning Tractor and Equipment
Company Limited
Vancouver, British Columbia

*Members of the executive committee

Officers

Chairman of the Board
A. Jean de Grandpré, Q.C.

President and
Chief Executive Officer
Walter F. Light

Executive vice-presidents
Donald A. Chisholm
Technology

Robert A. Ferchat
Finance

Marcelo A. Gumucio
Marketing

Charles G. Millar
Operations

James G. Stark
U.S. operations

Vice-presidents
Clive V. Allen
General counsel

Walter C. Benger
Market development

John T. Burnett
Secretary and assistant
general counsel

Roy T. Cottier
Corporate relations

J.D.M. Davies
Business development

Desmond F. Hudson
Technology planning

Ronald A. Hunter
Operations planning

Robert H. Lane
Marketing, special studies

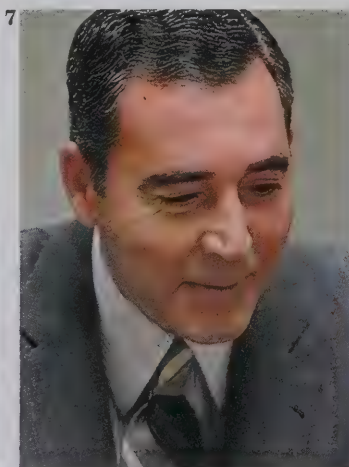
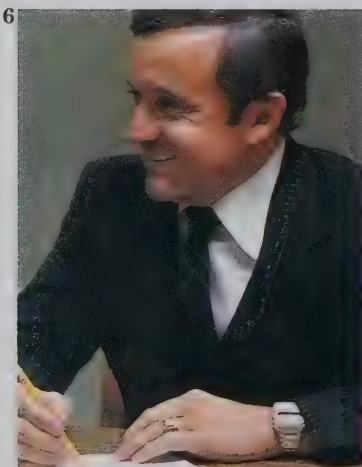
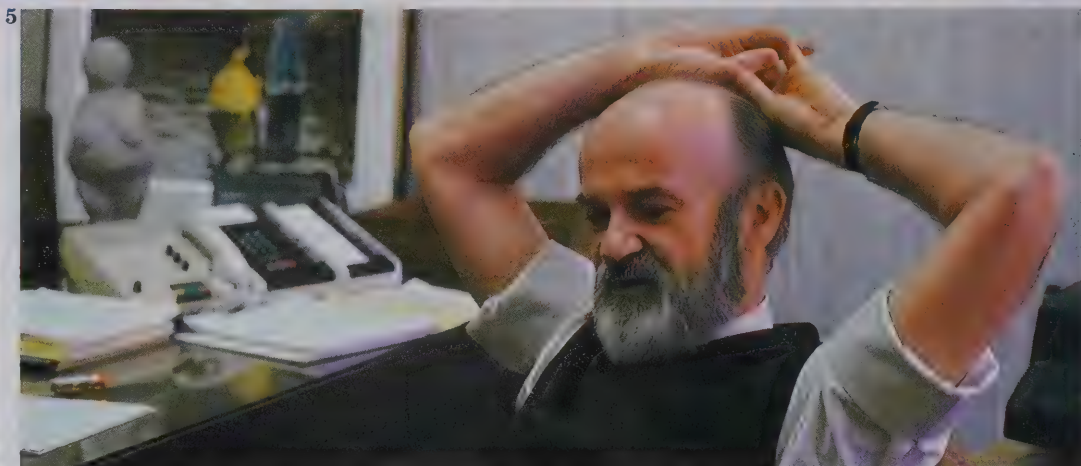
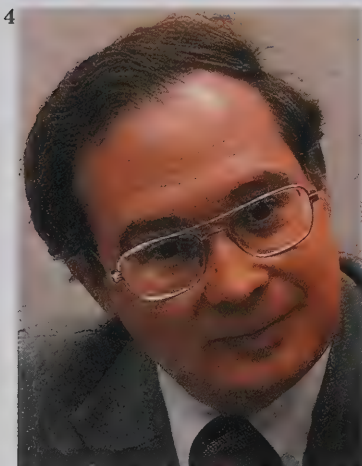
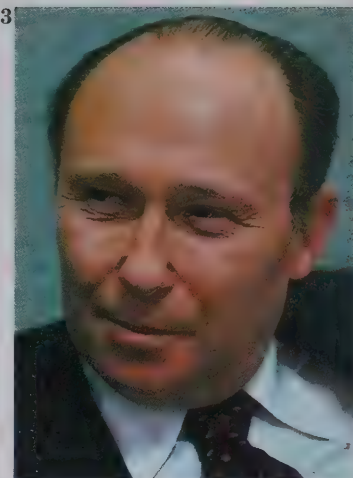
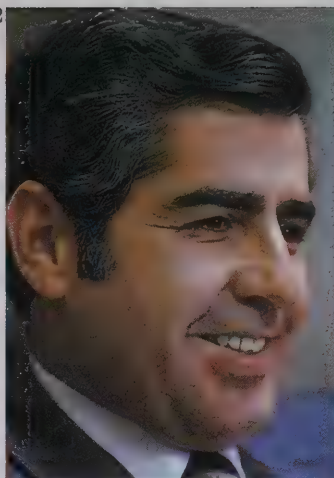
John D. MacDonald
Technology management

Edward B. Matthews
Business systems

Donald A. Noble
Human resources

John A. Roth
Operations, manufacturing

Lloyd A. Taylor
Semiconductor components



1. (left) George W. Sullivan, president and CEO, Northern Telecom, Inc. (Nashville, Tennessee) with Basil A. Beneteau, president and CEO, Northern Telecom Canada Limited (Islington, Ontario).

2. Marcelo A. Gumucio, executive vice-president, marketing, Northern Telecom Limited.

3. Charles G. Millar, executive vice-president, operations, Northern Telecom Limited.

4. C. Denis Hall, president, Bell-Northern Research Ltd. (Ottawa, Ontario).

5. Donald A. Chisholm, executive vice-president, technology, Northern Telecom Limited.

6. Leonard N. Mackenzie, president and CEO, Northern Telecom Systems Corporation (Dallas, Texas).

7. James G. Stark, executive vice-president, U.S. operations, Northern Telecom Limited.

8. Robert A. Ferchat, executive vice-president, finance, Northern Telecom Limited.

Officers of principal subsidiaries

Bell-Northern Research Ltd.

Chairman of the Board
Donald A. Chisholm

President
C. Denis Hall

Group vice-president
L. Colin Beaumont
Development

Vice-presidents
Howard M. Bender
Digital switching systems development
John Elliott
Network products
Harvey S. W. Goodwin
Administration
Robert Kenedi
Systems

Eugene B. Lotochinski
International
Alan G. Lutz
Terminals development
Lloyd A. Taylor
Technology

Secretary and legal counsel
Roger W. Hacker

Treasurer and controller
Frank T. Chaikowsky

BNR Inc.

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C. Denis Hall

President
John S. Buchan

Vice-presidents
Peter P. Gruchala
Administration
Kay B. Magleby
Staff

Charles E. Staples
Systems

Eugene J. Swystun
Development

Secretary
Roger W. Hacker

Controller
Bernon Gottlieb

B-N Software Research Inc.

President
John H. Aitchison

Vice-presidents
Eric Bierman
Communications Product Development
Richard D. Cuthbert
Business Information Systems

Secretary
Roger W. Hacker
Controller
E. Wayne Campbell

NETAS-Northern Electric Telekomünikasyon A.S.

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Managing director
C. Roger Lawton

General secretary
Iskander N. Taner

Controller
James E. Hughes

Northern Telecom A.G.

Managing director
Hugh A. Hamilton

Northern Telecom (Asia) Limited

Managing director
Mendel C. Cohen

**Deputy managing director
and controller**
Brian A. Robson

Northern Telecom (CALA) Corporation

President and general manager
Jean-Paul Gagnon

Northern Telecom Canada Limited

**President and
Chief Executive Officer**
Basil A. Beneteau

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Ewart O. Bridges
Switching
David G. Vice
Transmission

Kenneth H. Woodley
Subscriber equipment

Senior vice-presidents
William J. Pardy
Administration

H. Lloyd Webster
Marketing and Technology

Vice-presidents

Clare A. Anderson
Western Canada
David D. Archibald
Secretary and general counsel
André J. Boutin
Cable
John W. Caffry
Controller and treasurer
Robert M. Cuddy
Manufacturing
Richard A. Fortier
Personnel and industrial relations
Roy Merrills
Subscriber switching
Elliott Turcot
Advanced switching
D. Wynn Walters
Public relations

Northern Telecom, Inc.

**President and
Chief Executive Officer**
George W. Sullivan

Group vice-presidents
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Networks
Charles J. Graham
Products
Thomas R. Worthy
Telephone companies

Vice-presidents
William C. Cawthon
Operations
Robert W. Duthie
Business development

Jerry L. Kreiger
Human resources
Eugene B. Lotochinski
Technology

John MacDonald
Finance and treasurer
Richard R. Standel, Jr.
General counsel and secretary

Controller
David C. Cairns

Northern Telecom Industries Sdn. Bhd.

Managing director
Ho Boon Theam

Secretary
C. Ong Chye Lee

Northern Telecom International Limited

**President and
Chief Executive Officer**
William T. Simpson

Vice-president
Jean-Paul Gagnon

Secretary
John T. Burnett

Northern Telecom (Ireland) Limited

Chairman of the Board
Lord Killanin

Managing director
Patrick J. Hogan

Controller
Aiden Holleran

Northern Telecom (Middle East) Limited

Managing director
Brian Baynes

Northern Telecom Systems Corporation

**President and
Chief Executive Officer**
Leonard N. Mackenzie

Group vice-presidents
Frank T. Connors
Computer Systems
Edward J. Mattiuz
Business Communications
Melvin E. Stever
Customer service

Senior vice-president
Palle Kiar
Business development and planning

Vice-presidents
Douglas C. Cornwall
European operations
Richard R. Standel, Jr.
General counsel and secretary
William J. Waibel
Distributor sales

Northern Telecom Limited and principal subsidiaries

At the end of 1979 Northern Telecom operated 55 manufacturing plants, up from 52 a year earlier; employed 33,301 people, an increase of five percent from 31,756 at the end of 1978, and had assets of \$1.885 billion, up 40 percent from \$1.344 billion.

Northern Telecom Canada, the corporation's largest subsidiary, manages 26 manufacturing plants in Canada producing a broad range of telecommunications products and systems primarily for the Canadian market. About 20 percent of NTC's sales in 1979 were parts, components and products exported to customers around the world, including Northern Telecom's facilities in the United States and overseas.

Northern Telecom, Inc. in the U.S., manufactures and markets telephone switching systems and other

telephone industry products for the common and specialized common telecommunications carriers in the U.S. NTI has become the leading supplier of digital telephone switching systems to telephone companies throughout the U.S. At year-end, it had 14 facilities operating in 12 states, and one plant each in Canada and Brazil. Three other plants were under construction in the U.S.

Northern Telecom Systems Corporation is responsible for the manufacturing and marketing of electronic offices systems, including PABXs, to business and other institutions in North America. It also has an extensive overseas network.

NTSC had eight manufacturing facilities in the U.S. and one each in Great Britain and the Republic of Ireland.

The corporation's telecommunications manufacturing and marketing operations outside of North America are directed by Northern Telecom International Limited. It manages plants in Malaysia and the Republic of Ireland, and is also responsible for the operations of NETAS-Northern Electric Telekomünikasyon, A.S. in Turkey, employing 1,807 (not consolidated in the corporate total) in the production of telecommunications systems for that country.

Bell-Northern Research Ltd. is the largest private industrial R&D organization in Canada. It operates six facilities in Canada and a laboratory in the U.S.



Software: mind over machine in the Intelligent Universe

**"Great discoveries and improvements invariably involve the cooperation of many minds."
Alexander Graham Bell**

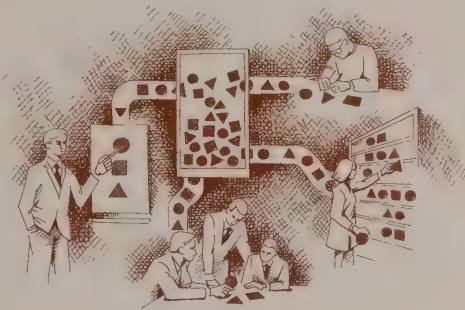
Northern Telecom's major challenge this decade is to design, produce and sell highly sophisticated communications equipment that people will find as easy, desirable and economical to use as the standard telephone set. Crucial to the corporation's success in the 1980s is its ability to identify and satisfy popular demand for communications systems which, in addition to processing vast amounts of information very rapidly, make the information understandable and useful to large numbers of people.

The single most important technology Northern Telecom is developing to help meet its challenge is software—the human logic which controls machines. The corporation is investing substantial amounts of money and effort in the development of software which will help make complex electronic communications systems simpler, less expensive and more appealing to both the professional and non-professional user.

An Intelligent Universe

As our society evolves from the Industrial Age to the Age of Information it faces the possibility of fundamental change. The evolution can alter our political and social structures, the way we work, our laws, transportation, family life, entertainment and most other aspects of the way we live.

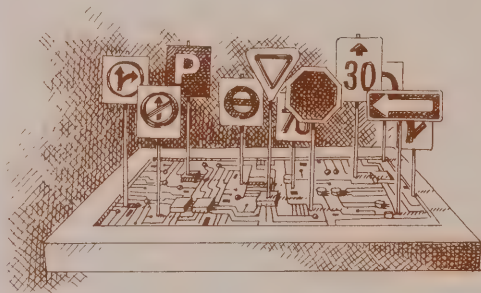
We cannot predict all the effects of the evolution, or how quickly it will occur. But, on the evidence of the changes we are now witnessing, we can assume that in this decade people will begin to learn, think and communicate in ways we have never known. Groups and individuals will be able to acquire, use and share vast amounts of information.



If we use this new potential wisely, we will find solutions to some of our most persistent and perplexing problems. By challenging existing ways of doing things, we may find answers to questions that have puzzled us for generations in education, business, medicine and other areas of our lives.

The cause of the evolution, the social force which is making it happen, is the growing complexity of modern life. People, in order to survive and prosper, need more and better information. They need the information to earn a living, to keep abreast of world events, to affect their government, to maintain their health and, generally, to make decisions and achieve personal satisfaction. The technological phenomenon which is making the evolution *possible* is progress in the field of electronic communications and computers.

Since the 1960s we have seen the gradual formation of complex electronic networks in which computer-like communications equipment channels the flow of information, and computer-based information systems act as points-of-entry to the networks. Northern Telecom calls this emerging international grid of information networks and input/output devices the Intelligent Universe.



The Intelligent Universe will help satisfy our society's escalating need for instant information. By the end of the century, 20 years from now, most people will be able to use the Intelligent Universe to share their own intelligence with almost countless others. Subject only to society's controls, the Intelligent Universe will be an ever-changing information library, a giant calculating machine, and a nearly limitless communications channel, to be used by virtually anybody who needs or wants to use it. It will put information at people's fingertips and under their control.

The design, production and marketing of information-handling equipment to operate the networks of the Intelligent Universe and to provide easy human access to them constitutes Northern Telecom's major corporate thrust for the 1980s. It was described in last year's annual report to shareholders.

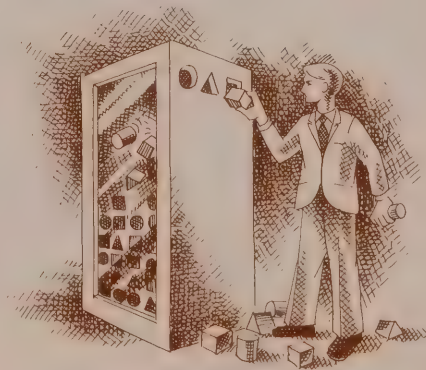
Software plays a leading role

The catalyst for the formation of the Intelligent Universe, the technological trend which got it started, is the gradual coming-together of telecommunications and electronic computing. The trend began in the early 1960s and will accelerate in the 1980s.

Telecommunications and information processing are moving in the same direction for two reasons. One: the work done by telecommunications equipment and computers is increasingly similar. Two: both make extensive use of integrated circuits and software.

Integrated circuits, commonly known as electronic chips, are tiny devices, often the size of a baby's fingernail, which contain thousands of electronic components. They are less expensive and process more information, more rapidly in a given period of time than either of their predecessors—discrete electronic components such as transistors, capacitors and resistors and, before that, vacuum tubes, gas tubes and relays.

The dramatic development of integrated circuits in the last decade has been widely publicized. Much less well-known, but equally significant, is the development of software, the logic which controls and coordinates the operations of electronic systems and components. Together, integrated circuits and software allow people to extend a portion of their own intelligence to electronic systems. By memorizing human logic in machine-readable form, electronic systems know what to do with given information.



In this decade software is expected to undergo its greatest development. Northern Telecom and other telecommunications manufacturers will spend as much time, effort and money on the improvement of

software as they devoted to improving the physical aspects of communications equipment in the 1960s and 70s.

Software received relatively little attention from the telecommunications industry until recently because most of the cost of telecommunications systems was in the tangible, physical equipment, called hardware. However, the widespread deployment of integrated circuits has lowered substantially the cost of hardware. In addition, much of the work previously done by hardware is now done by software. As a result, software is becoming the more costly element of a telecommunications system. But it also offers the most opportunity for cost-reduction and for making telecommunications systems simpler and easier to use.

Software's roots

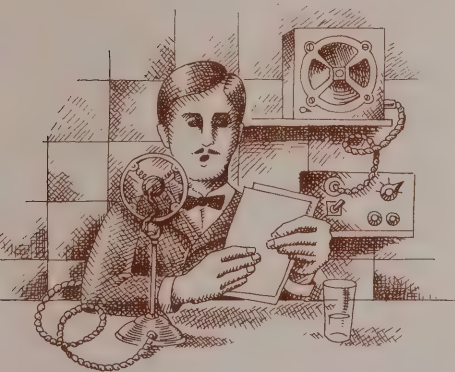
Software, in a sense, has existed since the very beginning of the electronics industry. Logic, after all, is needed to design and operate any piece of equipment. But, at first, logic was built directly into electronic equipment. Once the equipment was designed and built, it could be changed or adapted to a customer's particular requirements only by adding or removing certain physical components.

Thus, electronics was at first a purely physical technology. It concerned itself primarily with how to generate, channel and control the flow of electricity through physical media. In fact, in its earliest stages, electronics was hardly distinguishable from electrical engineering. The development of communications equipment depended on advances in this technology.

Equipment manufactured by Northern Telecom and its corporate predecessors over the last 100 years therefore paralleled advances in electrical engineering and its sister disciplines, physics and electronics.

In 1874 Alexander Graham Bell conceived the telephone and another experimenter, Johnstone Stoney, first used the ancient Greek term *electron* to describe the smallest element of an electric current. Within less than a decade, Northern Telecom's ancestor, the manufacturing department of the Bell Telephone Company of Canada, was producing telephone sets for the commercial market. By the turn of the century Northern Telecom produced telegraph equipment, wet and dry cell batteries, and phonographs.

As scientists developed electronic theory and devices in the early 1900s, Northern Telecom began to produce microphones and radio-telephone apparatus. In the early 1920s the company manufactured vacuum tubes, wireless radio receivers and radio station broadcast equipment.



In the 1930s it produced mobile radios for automobiles and transmitter/receivers for airplanes. During World War II it made magnetron tubes for radar, electronic navigational equipment and other military communications equipment. After the war, the company used this experience to design electronic telecommunications transmission systems for civilian use.

At about this time the electronic computer industry was born. The electronic principles which had been used for more than two generations by the telecommunications industry were added to mathematical theories developed centuries earlier and applied to the calculation of numbers. The first electronic computer, called ENIAC (Electronic Numerical Integrator and Computer) was built in 1946.

The invention of the computer was a major technological breakthrough. It demonstrated that digital technology—turning electrical currents on and off to represent specified bits of information—makes electronic equipment more powerful and efficient. Digital technology had made the electronic computer viable.

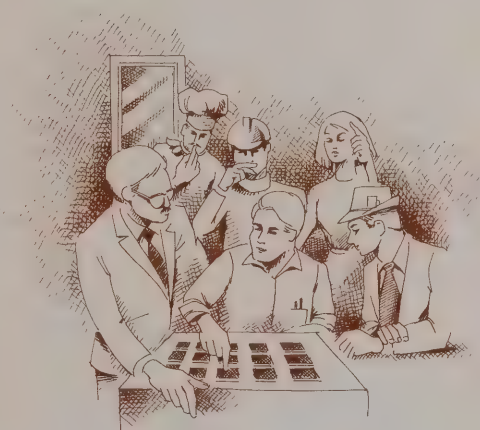
Northern Telecom applied the new digital technology to earth-bound transmission systems and to the satellite communication systems it produced in the 1960s. But the technology remained too expensive for widespread use in other applications, such as telecommunications switching, until the development of integrated circuits.

Paralleling the development of digital technology, and equally significant, was the discovery that the usefulness of electronic systems could be further increased by a method called stored-program control. Human instructions could be inserted into an electronic machine to do a specific task and removed when the task was finished. New instructions could be inserted for other tasks, making the machine an almost universal tool. These instructions were eventually called software.

Northern Telecom introduced stored-program control to electronic switching systems in the 1960s. The first of these were analog, or non-digital. But in 1976 the corporation announced the Digital World—a complete line of switching and transmission systems based on both software control and digital technology. It was the first company in the world to do so.

Software today is a social science

Today, Northern Telecom places as much emphasis on software as on the physical aspects, the hardware, of the systems it designs and produces. The most important questions asked by the corporation's scientists, engineers and marketing specialists now have to do with the human elements of communications. How can people derive the most benefit from the electronic systems that have been evolving at Northern Telecom in the last hundred years? How can access and control of machines which potentially can communicate almost anything, be given to as many people as possible? How can individuals with different information needs instruct electronic machines to do precisely what they want them to do?



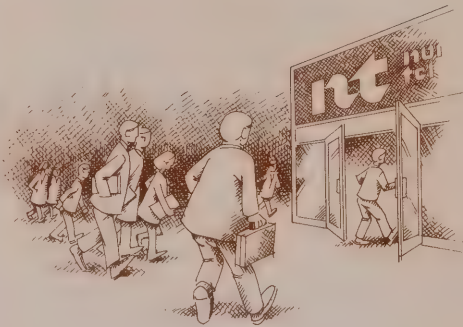
Much of Northern Telecom's current and future success depends on finding innovative answers to these and similar questions. The search is not only technological. It involves knowledge of human psychology, an understanding of the growing desire for more information, and most importantly, a commitment to making products which satisfy immediate and real human needs. Many of the answers, then, cannot be found in traditional physics, or electronics, or other purely physical sciences. Most of them will be found in software, many of the aspects of which are making it the newest *human science*.

Our investment is substantial

Almost half the development cost of Northern Telecom's digital switching and transmission systems is for software. By the mid-1980s software may account for an average of some 80 to 85 percent of the development cost of each new product.

Overall, Northern Telecom currently invests about \$70 million a year in the design, maintenance and improvement of software. Of this, about \$40 million is spent by operating subsidiaries and about \$30 million by Bell-Northern Research and other research and development (R&D) subsidiaries. Most is spent on software to be used in products. Some is also spent on the in-house systems needed to manage the corporation.

Employees specializing in software development are among the fastest-growing segments of the Northern Telecom workforce. At the beginning of 1980 the corporation employed about 2,900 software specialists.



These represent about 70 percent of technical design and development specialists. Two years earlier, software specialists were only about 60 percent of this segment of the workforce.

Most of Northern Telecom's software specialists work on projects related directly to the design of products. Others, because high-technology manufacturing requires sophisticated and efficient corporate organization, design software-based business systems which help managers operate the corporation in such areas as finance, manufacturing, general administration and marketing.

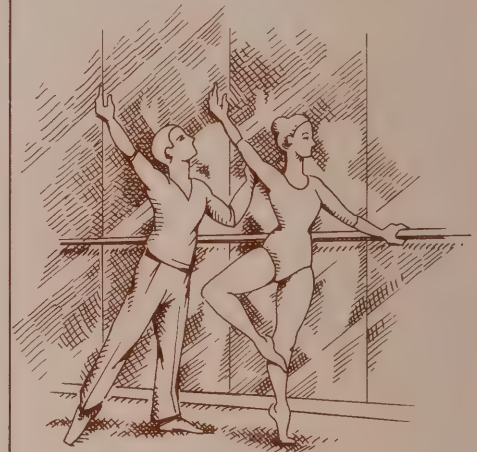
Northern Telecom has recruited some of the most highly qualified and experienced software specialists in the world. They are assigned to examine the basic processes in the development of software, to identify fundamental problems, to search for new opportunities, and to develop long-term strategies and solutions. Their work involves some of the most ingenious and complex systems ever invented. But, although the software systems themselves may be too complex for a layman to understand, or even to imagine, many basic principles of software are not.

The basics are simple

Software is logical human instructions given to a machine to tell it what to do. At Northern Telecom the instructions are usually created by people specializing in communications, and the machines which follow the instructions are electronic.

A machine can store its instructions and carry them out differently for each different type of information it receives. This ability to make decisions in accordance with stored human instructions is a basic ingredient of what is known as *machine intelligence*. Virtually all of Northern Telecom's digital switching and transmission systems, some subscriber apparatus, and most of its computer-data terminal systems are software-controlled intelligent machines.

One of the easiest ways to understand how software works is to compare it to choreography—the ordered instructions given to dancers, usually in ballet, to tell them what to do at any given moment.



Software, to coin a phrase, can be seen as electro-choreography. Ballet choreography directs body movements and gives them meaning. Software directs the performance of electronic machines and gives them purpose.

Instructions are in layers

Complex software systems are arranged hierarchically in layers of detail. At the bottom are several hundred-thousand single instructions which tell an electronic machine, or parts of a machine, what specific action to take at any moment. At the top are the most general instructions, for perhaps a number of machines or groups of machines.

Compare this to ballet. Instructions in choreography are also in layers of detail. In the bottom layer are many single instructions which tell each dancer how to move various parts of his or her body. A middle layer of more general instructions tells the dancer how to position his or her body in relation to other dancers. The top layer directs all dancers in relation to the musical score. The score is the most general of all instructions. It sets the mood and rhythm for all dancers and directs the whole ballet.

In telecommunications software, the most general instructions are sometimes called planning systems. A telephone company, for example, would develop a planning system to coordinate the operations of all of its switching and transmission equipment. Groups of instructions arranged in some logical order are called *programs*.

The simplest software system is a portion of a single program. In a Northern Telecom computer terminal system, such a program might tell the terminal to take the information which it receives and to send it to a computer. All a user has to do is insert the information.

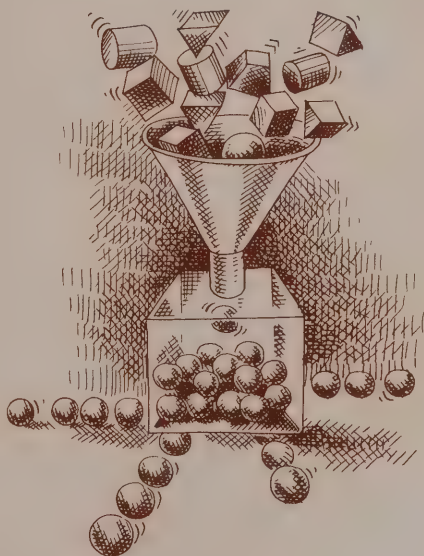
The software in Northern Telecom's CALRS (Centralized Automated Loop Reporting System) is an example of a complex software system. CALRS is a computer-based telecommunications service repair bureau. It helps monitor and diagnose faults or breakdowns in a local telecommunications network.

Its software directs the storage of subscriber-line records, trouble records and detailed instructions for automatic testing of telecommunications lines. CALRS greatly simplifies and enhances the work of telephone company employees whose job it is to diagnose problems and dispatch repair personnel.

Bridges between people and machines

A choreographer's instructions can also be classified by how well dancers understand them. The most understandable instructions might be very specific: "Lift your arms and leap forward". If the choreographer were to use *jeté*—a more general term which includes both lifting arms and leaping forward—an inexperienced dancer might not know what to do.

In electronics, only concrete, specific instructions are understandable to a machine. And a machine is "unforgiving" if the instructions given to it are incomplete or illogical. It either stops completely or makes mistakes. But humans tend to think in generalities. Their instructions are sometimes ambiguous or illogical. So, software programs have been developed to help translate general human instructions into the specific instructions required by machines.



A *machine-level* or *low-level* program is most detailed. It is in binary form—ones and zeros—and tells the machine which circuits to switch on and which to switch off.

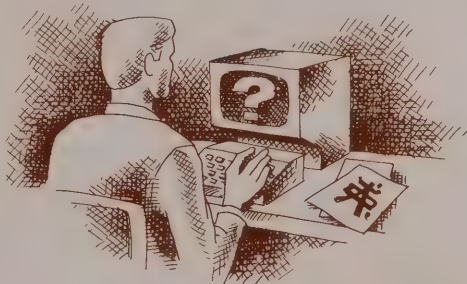
The instructions in *high-level* or *user-level* programs are most generalized and resemble plain English. Such programs have been designed for Northern Telecom's SL-1 digital business communications system and for the DMS family of digital switching and transmission systems. The programs enable the owners of a system to add new features to individual telephone sets or make other functional changes simply by entering general instructions which resemble natural human language.

Assembler and *compiler* programs translate general instructions written by humans into specific instructions understandable to machines. They serve as a bridge between user-level programs and machine-level programs and therefore make machines "forgiving". This, obviously, makes complex electronic systems easier to use.

Software is many languages

A choreographer rehearsing a company of dancers from different countries has to instruct individual dancers in some language they understand. Sometimes ballet instructions are recorded on paper—this is called ballet notation. But if the choreographer is addressing dancers verbally, he must use either the native language of each dancer or, as is usually the case, a common language which all dancers have learned to understand. Ballet choreographers usually use French for this purpose.

In electronics, almost all instructions are written; few are verbal. Instructions people give to a machine must be written in a language which the machine has been designed to understand.



About 1,500 software languages have been invented, but as with human-to-human languages, only a handful are used most of the time. Some of the more common international languages are used in 80 to 90 percent of computer applications. They include APL (A Programming Language), Basic (Beginner's All-Purpose Symbolic Instruction Code), Cobol (Common Oriented Business Language), Fortran (Formula Translation), and PL-1 (Programming Language One).

Most user-level software languages, such as the ones mentioned, are based on English, but the characteristics of each language—its structure, syntax and semantics—make it more suitable for one purpose than another. Humans can perhaps communicate certain emotions to each other better in Italian or Russian, and business or scientific data in English or German. Similarly, some software languages are better suited to scientific applications and others to business problems. Northern Telecom designers have developed specialized languages best suited for telecommunications. Protel (Procedure Oriented Type Enforcing Language), for instance, was created in-house for applications such as the DMS family of switching systems.

The SL-1 business communications system also has its own easy-to-use language. The simplicity of the language means that telephone installers do not have to have special training or experience in data processing. The commands they key into an SL-1 system are similar in form to everyday English.

The language designed for the SL-1 has proven so successful that it is now used in other Northern Telecom systems, such as the SL-10 packet switching system. The SL-10 is a digital switching system for long-distance data communications. It is the backbone of Bell-Canada's Datapac network and has been sold to telephone administrations and large corporations in Europe.

Giving software a physical form

Software, like choreography, is abstract. Its effects cannot be seen, heard, touched or tasted—until it is put into action. You can read ballet notation but you cannot *see* a ballet until it is danced. Similarly, a software program can be read if it is written on paper, but its effect cannot be perceived until the program is acted on by an electronic machine.

Software acquires physical form when it is entered into machines as numerical digits. It is entered either directly into a machine—and stored in electronic memory—or it is placed into peripheral machines which hold instructions until the main machine is told to use them. In older peripheral systems, digits are represented by the presence or absence of a punched hole in a specific space on a paper card. In most new systems the digits are represented by the magnetic state of metallic particles embedded in magnetized tapes and discs. Sensing devices read the encoded instructions and transmit them to the machine as on-and-off pulses.

Instructions can also be fed directly into a machine through an input terminal. Instructions are keyed-in on a keyboard, a device which resembles a regular typewriter, and may be displayed on a CRT (cathode ray tube) which looks like a TV screen. Instructions entered through terminals can also be stored on peripheral media such as punched cards, magnetic tapes and discs. The terminal systems manufactured by Northern Telecom Systems Corporation use keyboards and CRTs. They can be equipped with magnetic discs, printers and other peripherals to increase their usefulness and efficiency.

In the same way that a choreographer does not know if his ideas are feasible until he sees them performed, a software designer doesn't know if his software functions properly until he tests it. He can try it either on an actual machine or a computer which simulates the machine's operations. Bell-Northern Research is a leader in designing special-purpose software which simulates performance of telecommunications equipment and helps designers test their work thoroughly before releasing it to customers.

Characteristics of telecommunications software

Fundamentally, telecommunications software is no different from software designed for computers or other electronic applications. Software in each industry, however, does have some distinguishing characteristics.

The major distinguishing characteristic of telecommunications software is its reliability. Telecommunications equipment, because so many people depend on it, must not break down very often.



It is Northern Telecom's objective, for instance, to design DMS switching systems which will operate with no more than two hours downtime every 40 years. The designers of software for DMS equipment have to foresee virtually all potential problems which might arise and either eliminate them or devise methods for circumventing them before a single system is installed.

There are other important characteristics of telecommunications software. Telecommunications software, for instance, has to be able to transfer operations to alternate systems during breakdowns or equipment changes. Even though large sections have been overhauled or completely replaced, many telecommunications networks have been operating every minute of the day for generations.

Another characteristic is that a telecommunications system cannot be shut down while information is entered, changed or retrieved. A telephone exchange, for example, cannot be shut down or "unplugged" every time information about a customer line is changed, added or removed.

Finally, telecommunications software has to be able to handle information from many sources. A telecommunications system is used by large numbers of people. Whereas even a very large computer cannot be used by more than a few hundred people at a time, millions of calls can be simultaneously travelling through a telecommunications network.

As a result of these stringent requirements, the quality of telecommunications software in many respects must be higher than in almost any other industry.

Our all-out commitment to quality

Until recently, software development has been seen as a kind of art form with the imaginative capacity of individual designers as its only constraint. To an extent, this is necessary to ensure creativity. But it would create serious problems if no two software specialists would design a software system the same way.

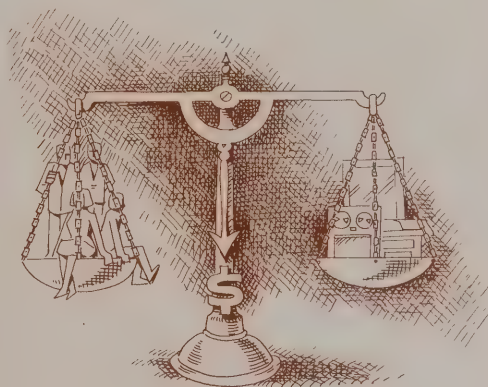


Their productivity could not be measured or improved, their designs could not be altered or enhanced by someone not familiar with their logic, and so on.

To avoid these problems, Northern Telecom and other progressive software designers are transforming software design from a quasi-art form to a field of engineering. Standards, methods and tools are being developed, classified and documented in the same way as in electrical, civil, mechanical or any other field of engineering. Researchers are assigned to look for new and better ways to produce software and to define corporate-wide software standards and test-systems. Software development teams are learning to apply the standards to the design of new products.

The result of the corporate-wide effort is superior software design and improved productivity of designers. Design flaws or mistakes in system-specification are discovered early—before a system has been implemented. Changing a software system to satisfy evolving customer needs is less costly. The management of software development is more efficient. Time and money are saved on repairing or modifying software systems. Systems are designed more quickly because designers can use off-the-shelf methods and prefabricated building-blocks of logic which may have been used countless times before and found to be effective.

In total, Northern Telecom's software systems are generally becoming more efficient and the cost of the corporation's software development is being brought into line with the development cost of hardware.



Yet, in spite of its commitment to improving software design, Northern Telecom continually monitors the cost-effectiveness of software in relation to hardware-based alternatives. In some cases, for instance, it is still less expensive and more efficient to use specially designed hardware to control electronic equipment. LSIs (Large-Scale Integrated circuits), as they become more powerful and less expensive, can have machine instructions built right into their design. If a designer wants to change instructions to a given machine he simply removes one component and substitutes another.

Software tomorrow

The 1980s will be the golden age of software—not only in telecommunications but in virtually all industries, institutions and groups which use or produce electronic equipment. By the end of the decade software development will have completed much of its growth and transformation.

The most exciting result of its transformation will be that software, and thus the control of powerful electronic communications equipment, will become accessible to more and more people. Specialists will design software building-blocks and show us how to use them. We will then use the building-blocks not only to play games or solve riddles on small home-computers, but we will be able to build software systems to help us look for solutions to perplexing social and economic problems.

Our health, medicine, government, education, culture, economy and all other social concerns will be able to benefit from the work of today's scientists and engineers.

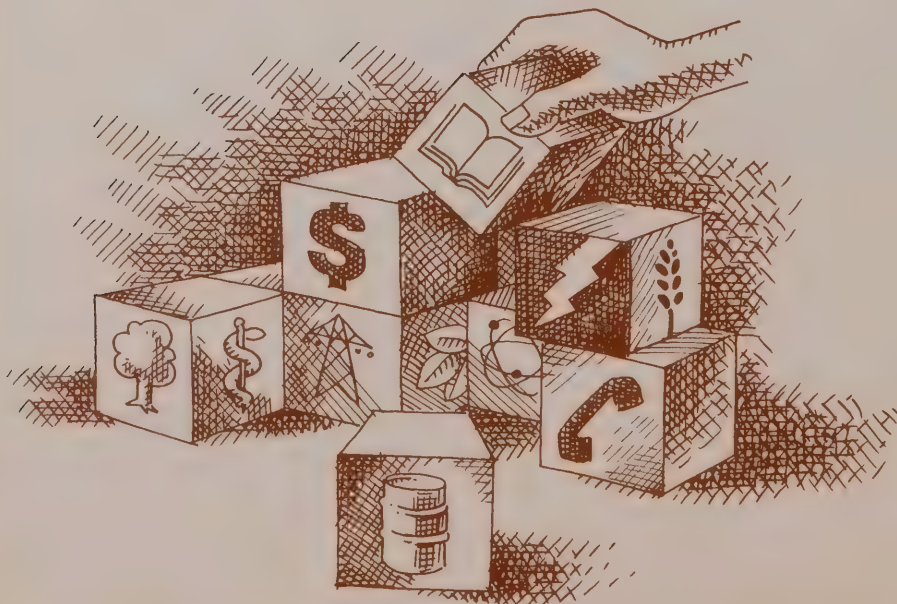
Northern Telecom's role in our society's evolution towards the Age of Information, and particularly in the transformation of software, will continue to be:

- to advance the state-of-the-art of software design and combine it with research into other methods for making electronic communications equipment less expensive and more useful; and,
- to engineer, manufacture and sell innovative software-based products for telecommunications networks, multifunction electronic office systems, integrated electronic communications systems for homes, and other selected elements of the Intelligent Universe.

By providing software which makes communications equipment more reliable, economical, flexible, timely and easy to use, Northern Telecom will maintain its technological and market leadership in the telecommunications industry.

*Software's impact on the telecommunications industry was described in detail in a recent special issue of **Telesis**, the internationally recognized technical journal of Bell-Northern Research Ltd. The issue includes articles on the role of software in telecommunications switching, its impact on network operations and maintenance, software metrics and other aspects of software engineering. **Telesis** is read by leading scientists, engineers and other telecommunications experts in some 70 countries. Copies of **Telesis** are available from:*

*Bell-Northern Research Ltd.
Dept. 8E50
P.O. Box 3511, Station C
Ottawa, Canada K1Y 4H7*



Financial review

Demands on Northern Telecom's financial resources grew in 1979 as we introduced several new digital systems and other products which had been under development in the 1970s; continued to increase R&D spending to develop products for the decade ahead; consolidated the acquisitions made in 1978, and achieved an accelerating rate of growth in new markets.

In 1979, Northern Telecom spent more money on research and development and new plants and equipment than in any previous year. Financing costs increased to cover the higher levels of inventories and accounts receivable required to support sales growth, and for leased electronic office systems. We incurred considerable expense in integrating the companies acquired during 1978 with our established operations. We opened or announced plans in 1979 for 15 new plants, plant manufacturing capacity expansions and R&D facilities.

Our success at penetrating new markets meant that sales to customers outside of Canada rose 76 percent in 1979 from the 1978 level. For the first time sales to customers in the United States and other world markets exceeded sales made to customers in Canada.

Substantial working and fixed-asset capital was invested to start-up manufacturing facilities and to introduce to the market a number of new products and feature enhancements for existing products or systems. These included in 1979: the Add-On Data Module for the SL-1 digital business communications system; the DMS-100 Family; the newest members of our Imagination telephone line, the stylish Athena and Diplomat; the e-Contempra with several popular features; Vutran, a microprocessor-based transaction

terminal used for such things as credit card verification; the BIX telephone wire connector system, and the Index dialer, which can store up to 100 telephone numbers for rapid dialing.

Record sales up 26.3 percent

Consolidated sales rose 26.3 percent in 1979 to a record \$1.901 billion, compared with \$1.505 billion in 1978. The companies acquired in 1978, Sycor and Data 100 (which are now part of Northern Telecom Systems Corporation (NTSC)), and Spectron, contributed \$385.7 million to sales in 1979, compared with \$185.2 million in 1978 from the dates of their acquisition. Electrical and electronics products distribution, discontinued at the end of 1978, had sales of \$162.8 million in that year.

Sales to Bell Canada, its telephone subsidiary and associated companies, rose in 1979 to \$695.9 million, compared with \$621.9 million in 1978. While Bell Canada continued to be our largest customer, the faster growth of sales to other customers reduced the proportion of sales to Bell Canada to 36.6 percent of total sales from 41.3 percent in 1978.

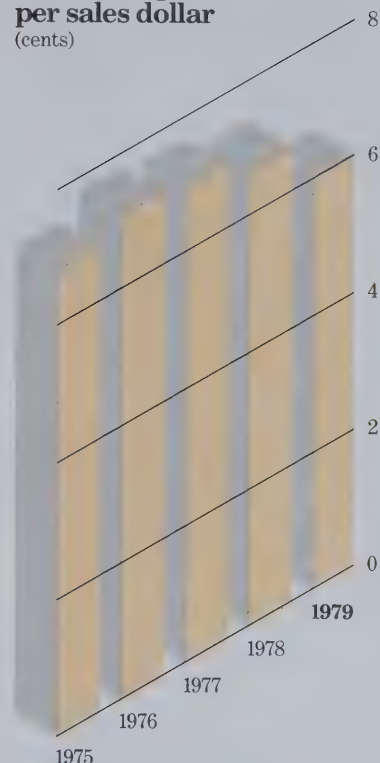
Telecommunications equipment sales rose 33 percent to \$1.505 billion, compared with \$1.131 billion in 1978. Strong performances were recorded by Northern Telecom Canada, and by Northern Telecom, Inc. in the U.S. The main reason for the increase was the demand for our advanced digital communications systems.

Growth took place in 1979 in all of our principal product line segments. Particularly strong were subscriber apparatus and business communications systems, and transmission products and systems.

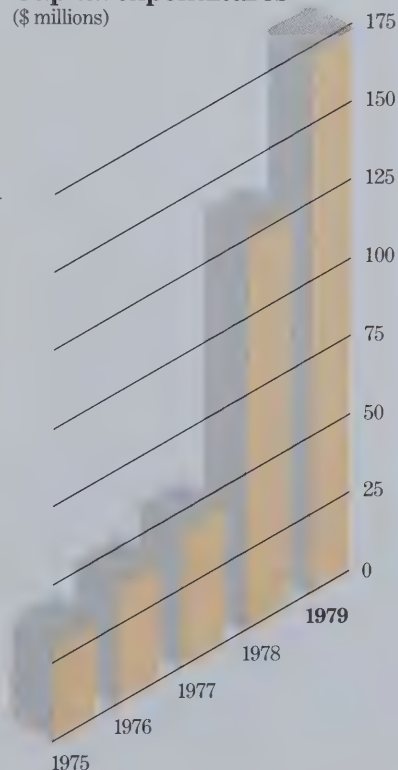
The growth in transmission sales was due in particular to the increased demand for our digital channel banks and the DMS-1 subscriber carrier system and to the consolidation of Spectron's sales of test systems.

Demand for the SL-1 in all markets was the largest single factor accounting for the growth in subscriber apparatus and business communications systems.

Net earnings per sales dollar (cents)



Capital expenditures (\$ millions)



Central office switching sales recovered from a decline in 1978, compared with 1977, reflecting the success of the DMS-10. Growth in this area, however, continued to be constrained pending our bringing on stream greater production capacity in 1980 for the more complex and higher capacity DMS-100 Family systems, successors to the SP-1.

Wire and cable and outside plant sales benefited from higher copper prices and growth in outside plant products sales in the U.S.

The increase in electronic office systems sales is due mainly to the consolidation of Sycor and Data 100 for a full year in 1979. Sales of Northern Telecom Systems Corporation (NTSC), responsible for our electronic office systems business, were adversely affected by an industry-wide trend toward leasing rather than outright purchase of equipment.

Sales by U.S. operations, including rental and service income, were \$739.6 million in 1979, compared with \$447.1 million in 1978; sales by Canadian operations were \$1.001 billion, compared with \$1.008 billion in 1978 (including \$162.8 million of sales from discontinued distribution operations), and sales by Northern Telecom companies outside of North America were \$160.1 million, up from \$49.6 million in 1978.

Costs rise proportionally with sales gains

Cost of sales increased in line with the growth in sales, 26.4 percent to \$1.304 billion, compared with \$1.032 billion in 1978. The consolidation of Sycor and Data 100 for the full year in 1979 and the discontinuance of the electrical and electronic products distribution business favorably affected gross profit margins. This was fully offset, however, by higher manufacturing expenses at Northern Telecom Canada and Northern Telecom, Inc., due mainly to costs related to substantially increasing manufacturing capacity to meet the demand for the corporation's new products, particularly its digital systems.

Selling, general and administrative (SG&A) expenses were \$280 million, up from \$228.9 million in 1978. The increase was due almost entirely to the full year's consolidation of Sycor and Data 100 costs. The electronic office

systems business requires a higher level of SG&A expense than does the telecommunications manufacturing industry. Increases in SG&A for our other operations were largely offset by the discontinuance of the distribution business.

Emphasis on research and development

Net research and development expenses also rose in line with sales and the corporation's belief that it must maintain a consistently high level of R&D expenditures relative to sales to maintain its international product leadership. Net R&D expenses were \$132.6 million, or 7.2 percent of total manufacturing sales, compared with \$97.8 million in 1978 when they were 7.5 percent of total manufacturing sales.

The development costs of our digital systems and R&D spending of companies acquired in 1978 were the principal reasons for the increased level of spending. Northern Telecom's net R&D spending amounted to \$574.4 million in the 1970s enabling the corporation to increase the sales of proprietary products from 10.2 percent of the total in 1970 to 77 percent in 1979.

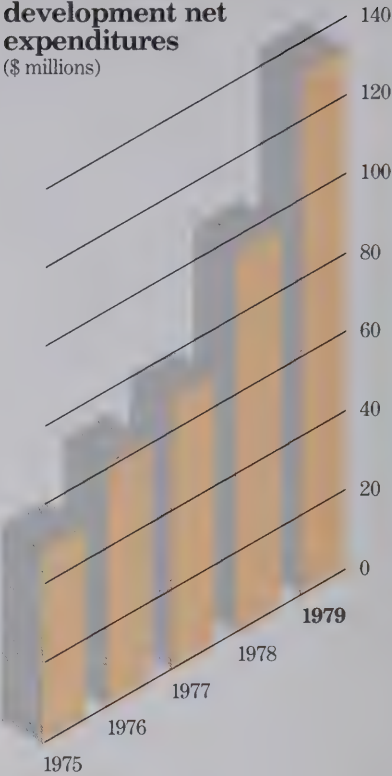
Operating earnings increase

Earnings from operations were \$183.8 million, up 26.1 percent from \$145.7 million in 1978, or 9.7 percent of sales in both years.

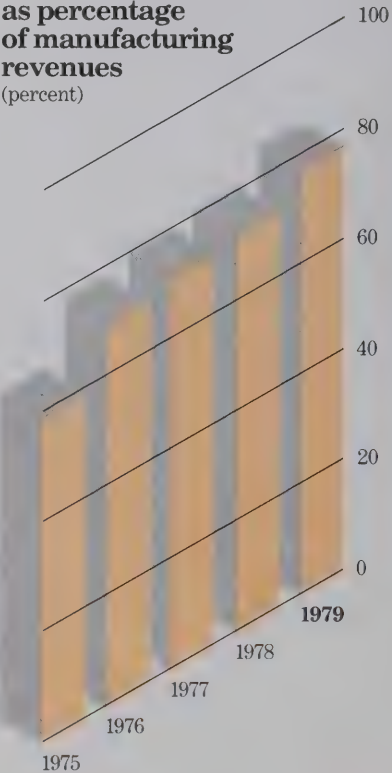
Examined by business segments, operating earnings as a percentage of sales declined slightly for telecommunications manufacturing to 15.6 percent compared with 16 percent in 1978. This slight decline was despite a number of pressures on margins, in particular the costs of increasing manufacturing capacity in Canada and the U.S., and the costs of bringing on stream production of new products and systems. These pressures are expected to continue into 1980.

Operating earnings for electronic office systems were 7.4 percent, compared with 18 percent in 1978. Operating results were, and will continue to be in 1980, negatively affected by the costs of integrating the companies acquired in 1978 which comprise NTSC; the costs of the reorganization of part of their manufacturing operations, and changes to its product line carried out during the year. Results in 1979 were also adversely affected by the trend in the computer industry toward customer leasing rather

Research and development net expenditures
(\$ millions)

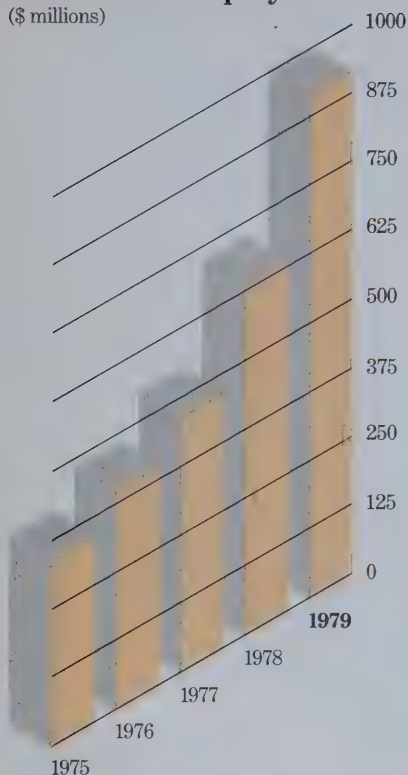


Proprietary products as percentage of manufacturing revenues
(percent)



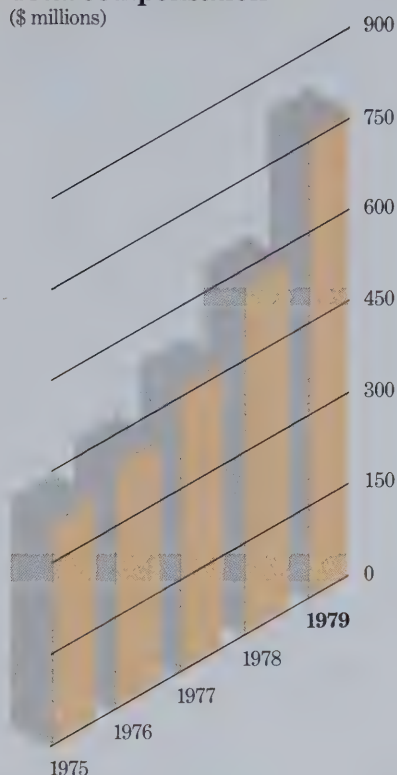
Shareholders' equity

(\$ millions)



Total compensation

(\$ millions)



than outright purchase of equipment, deferring earnings over several years. This is expected to continue in 1980.

Operating earnings for business segments do not include general corporate expenses which increased to \$78.4 million from \$74 million last year, largely because of higher salary and benefits costs.

On a geographic basis (where the products were manufactured, rather than where they were sold), operating margins, excluding R&D and general corporate expenses, were up in Canada (23.9 percent compared with 22.1 percent in 1978), declined in the U.S. (17.8 percent from 19.4 percent last year) and rose in the corporation's operations outside of North America (15.5 percent in 1979 compared with 14.5 percent).

Interest expense exceeds other income

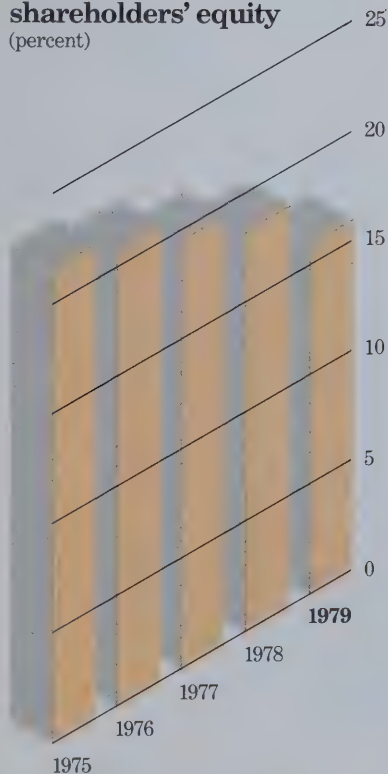
Reflecting the corporation's higher borrowing levels to finance its acquisitions and working capital requirements for manufacturing expansion; higher levels of inventories and accounts receivable to support its sales growth, and higher levels of interest rates, interest expense markedly increased in 1979 to \$38.2 million, compared with \$17.1 million in 1978.

Investment and other income was \$3.8 million in 1979, compared with \$10.6 million last year. The decrease in 1979 was due to a number of factors. These included additional amortization of goodwill relating to intangible assets other than the 1978 acquisitions; reduced earnings from a foreign subsidiary; Data 100 being consolidated in 1979 but accounted for on an equity basis for part of 1978, and the increase in the minority interest in the net profit of Bell-Northern Research. Net income of \$1.8 million was recorded from a technology cross-licensing agreement. The sale of an equity investment resulted in an after-tax gain of \$2.6 million.

There was a loss on currency translation of \$0.4 million in 1979, compared with a gain of \$5.1 million in 1978. The loss in 1979 was due to the slight increase of the Canadian dollar's value relative to the U.S. dollar and our larger level of assets in the U.S.

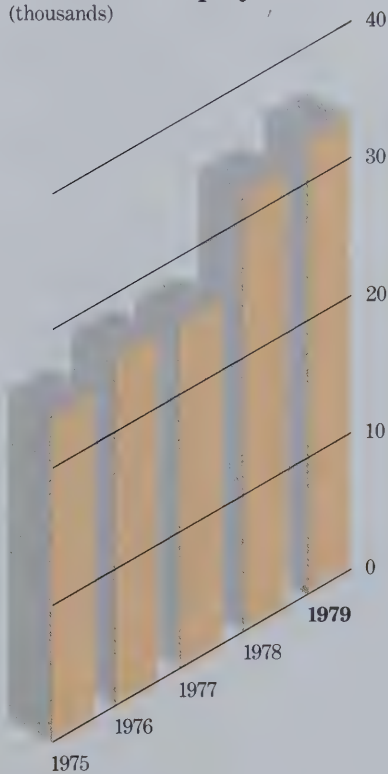
Return on shareholders' equity

(percent)



Number of employees

(thousands)



Lower corporate tax rate

The corporation's taxes in 1979 were \$35.5 million down from \$49.9 million in 1978. The decline was caused mainly by the low rates of tax payable by the corporation's foreign subsidiaries, and an additional R&D tax deductible allowance in Canada.

Record net earnings

Consolidated net earnings for 1979 were \$113.5 million, up 20 percent from the net earnings, before an extraordinary gain, of \$94.4 million in 1978. The extraordinary gain was \$6.3 million, resulting from a reduction in income taxes from the use of a subsidiary's prior years' losses. Earnings per share, based on an increased average number of shares outstanding, were \$3.70 in 1979, compared with \$3.33 in 1978 (\$3.55 per share including the extraordinary gain).

New plant and equipment, additions to lease base

Capital expenditures for plant and equipment increased \$23.9 million from the amount spent in 1978. The consolidation of the acquisitions for a full year, and the addition of electronic office systems to our lease base (a capitalized expense), meant an increase in our capital expenditures to \$173.5 million in 1979 from \$127.2 million.

Equity and debt increase to fund growth

Our financial strength is providing us with the capability and flexibility to make substantial investments to meet the demand for our products. Cash flow from operations was \$206.4 million in 1979 compared with \$176.2 million in 1978. This increase of 17 percent, however, was not enough to finance the growth of our operations.

In September, Northern Telecom raised about \$198 million through a public offering in Canada and the U.S. of two million common shares, and the private sale of an additional two million shares to Bell Canada. The public offering price was US \$43.00 in the U.S. and \$49.97 in Canada. These funds were used to retire debt in part incurred in the 1978 acquisition program.

The effects of increasing the number of shares outstanding was to reduce our return on average equity to 16.2 percent in 1979 from 18.9 percent in 1978. Northern Telecom's ratio of borrowed capital to equity at 18 percent is conservative relative to other companies in the electronics and data processing industries. If we had chosen to increase our debt position to a higher ratio, rather than issue additional equity, the return on average equity would, of course, have been higher. The sums invested in 1979 in anticipation of future sales growth also resulted in a decline in our return on investment to 15.3 percent in 1979 from 16.8 percent in 1978.

Long-term debt increased in 1979 to \$192.1 million at year-end, compared with \$189.8 million at the end of 1978. It is expected that this level will continue to be increased in 1980, but it is expected to remain conservative relative to the strength of our operations.

Backlog up 38 percent

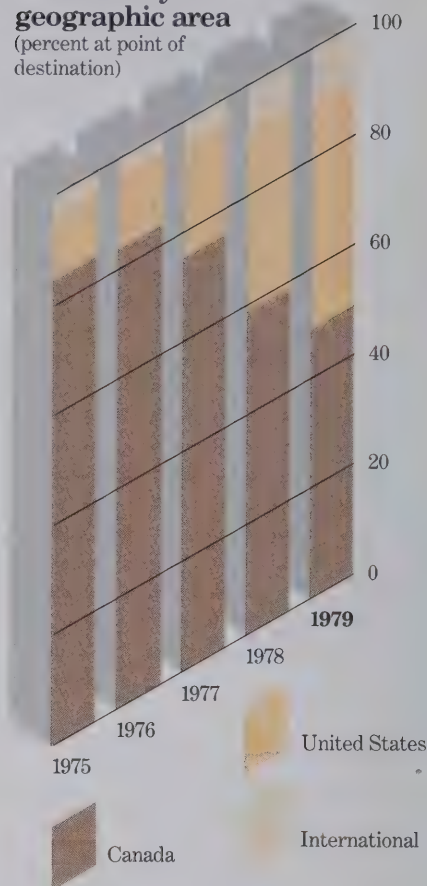
Reflecting, in particular, the demand for our digital systems, Northern Telecom's orders on hand at the end of 1979 were \$874 million, up 38 percent from \$635.3 million a year ago. The largest part of this increase, \$167.6 million, was in the U.S. market. The DMS supply agreements signed by Northern Telecom with several major telephone companies in the U.S., including AT&T, are for the most part not reflected in the order backlog, pending receipt of firm orders under the agreements.

Sixth consecutive annual dividend boost

Following the board of director's decision in November to increase the corporation's dividend for the sixth consecutive year, dividends paid in 1979 were \$0.85 or 23 percent of net earnings, compared with \$0.74 or 21 percent of net earnings in 1978. The 25 percent increase raised the quarterly payout to \$0.25 per share. The directors also approved the introduction in 1980 of a shareholder dividend reinvestment and stock purchase plan.

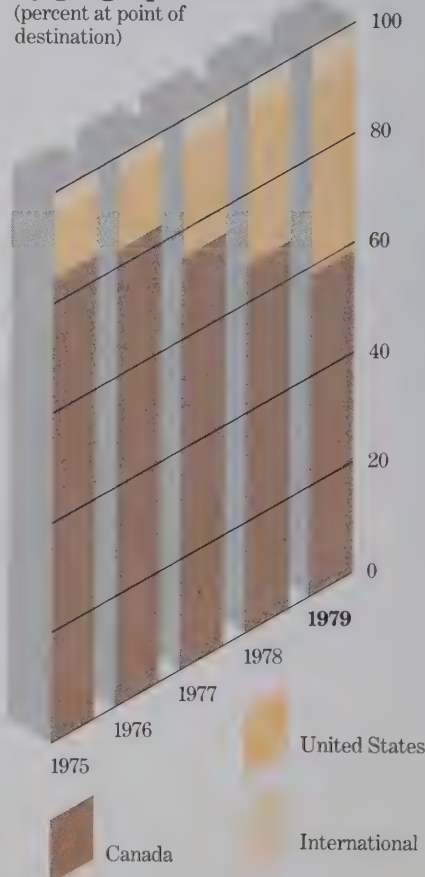
Total manufacturing revenues by geographic area

(percent at point of destination)



Telecommunications sales by geographic area

(percent at point of destination)



The corporation's shares are traded on the Montreal, New York, Toronto and Vancouver stock exchanges. On February 15, 1980, the closing price on the Toronto Stock Exchange (TSE) was \$46.00, and US\$39.75 on the New York Stock Exchange. The following table indicates the high and low quarterly share prices on the TSE during the past two years:

1979		
Quarter	High	Low
Fourth	54 1/2	43
Third	51 1/2	41 1/4
Second	48 5/8	43 3/8
First	48 1/2	36

1978		
Quarter	High	Low
Fourth	40 3/4	34 1/2
Third	39 3/8	31
Second	32 5/8	26 3/4
First	27 1/2	25

1978 versus 1977

Sales

Consolidated sales in 1978 were a record \$1.505 billion. For comparative purposes, 1977 sales were restated from the previously reported \$1.269 billion to \$1.222 billion, reflecting the deconsolidation of our Turkish subsidiary (NETAS). Sycor, Data 100, Spectron, and Danray, acquired during 1978, contributed \$228.2 million to sales.

Worldwide telecommunications equipment sales increased to \$1.131 billion, compared with \$1.018 billion, in 1977. Sales of central office switching systems declined reflecting a decline in the sale of analog systems, pending the availability in volume of the advanced DMS line of digital switching and transmission systems. This was more than offset by the sale of other products, especially subscriber apparatus and business communications systems, and wire and cable and outside plant products.

Sales were up in Canada, the U.S. and overseas markets, with the largest growth taking place in the U.S., where the sale of U.S.-manufactured products rose to \$447.1 million, compared with \$193.5 million in 1977. Of this increase, \$190.2 million was attributable to the acquired companies. Northern Telecom, Inc.'s sales were up 27 percent, reflecting demand for the SL-1 digital business communications system and for outside plant products.

Sales to Bell Canada, its subsidiary and associated companies, were higher, but declined as a percentage of total sales to 41 percent in 1978 versus 50 percent in 1977.

Costs

Cost of sales at \$1.032 billion in 1978, declined to 69 percent of sales, compared with 71 percent in 1977. This improvement was due to the effectiveness of the corporation's productivity and cost reduction programs and to the acquisitions of Sycor and Data 100, which have lower ratios of costs to sales relative to our other operations.

SG&A rose to \$228.9 million in 1978, an increase of \$69.7 million, including \$48.5 million from the companies acquired. Sycor and Data 100, in particular, have higher SG&A expenses as a proportion of sales than do our other operations. The remainder of the increase was mainly attributable to a build-up in marketing and administrative functions to support future expected sales growth.

Net R&D expenses in 1978 were \$97.8 million, or about 7.5 percent of manufacturing sales, a \$29.6 million increase from the previous year. The acquired companies contributed \$13.8 million to the increase.

Operating earnings and other items

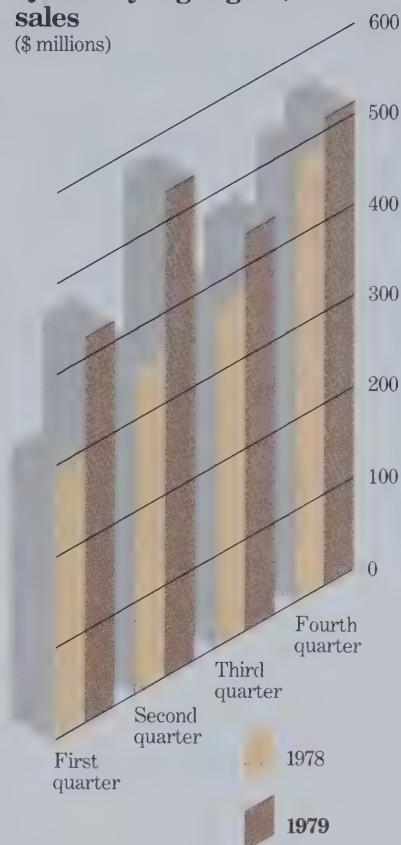
Earnings from operations were \$145.7 million in 1978, a 10 percent increase from the \$121.3 million earned in 1977.

Operating earnings declined as a percent of telecommunications equipment sales to 16 percent from 18 percent in 1977, reflecting higher SG&A expenses. The electronic office equipment business, acquired in 1978, had an operating margin of 18 percent. Operating earnings of the electrical and electronic products distribution business were virtually unchanged year to year at five percent.

Investment and other income increased to \$10.6 million from \$9.4 million in 1977, principally because of higher equity earnings from associated companies. Interest charges rose to \$17.1 million from \$6.6 million, reflecting increased borrowing to finance acquisitions and other investments, and higher interest rates. Unrealized foreign currency gains amounted to \$5.1 million in 1978 compared with \$6 million in 1977.

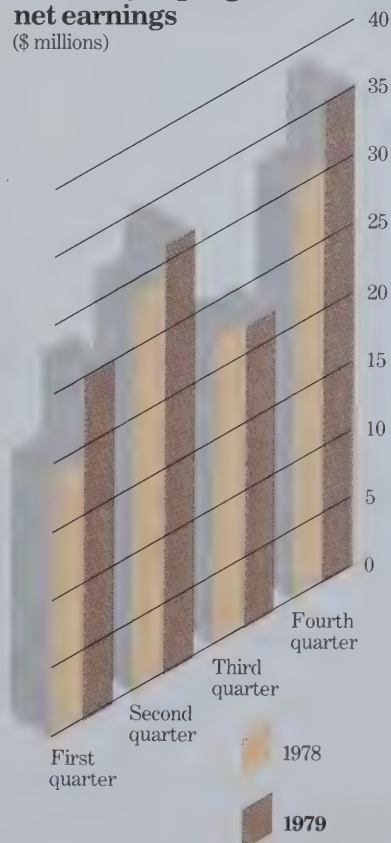
Quarterly highlights/ sales

(\$ millions)



Quarterly highlights/ net earnings

(\$ millions)



Extraordinary income resulting from a reduction of income taxes from the use of a subsidiary's prior years' losses, increased to \$6.3 million in 1978 from \$3.4 million in 1977. The increase was due to a change in Canadian income tax laws, permitting the transfer of losses from the subsidiary to the parent company and, accordingly, the full recovery within the year of the remaining \$9.5 million. A provision was made of \$3.2 million for the estimated costs of discontinuing at year-end the distribution business partially offsetting the extraordinary gain in 1978.

The effective income tax rate was 34.6 percent in 1978 compared with 37.1 percent in 1977. The decline was mainly due to an additional Canadian R&D tax credit and tax-deductible R&D allowance.

Consolidated net earnings were \$100.7 million, or \$3.55 per share in 1978, including the extraordinary gain of \$0.22 per share, compared with \$85.3 million in 1977, or \$3.22 per share, including the extraordinary gain of \$0.13 per share.

Business segments and principal product lines

(as approved by the board of directors)

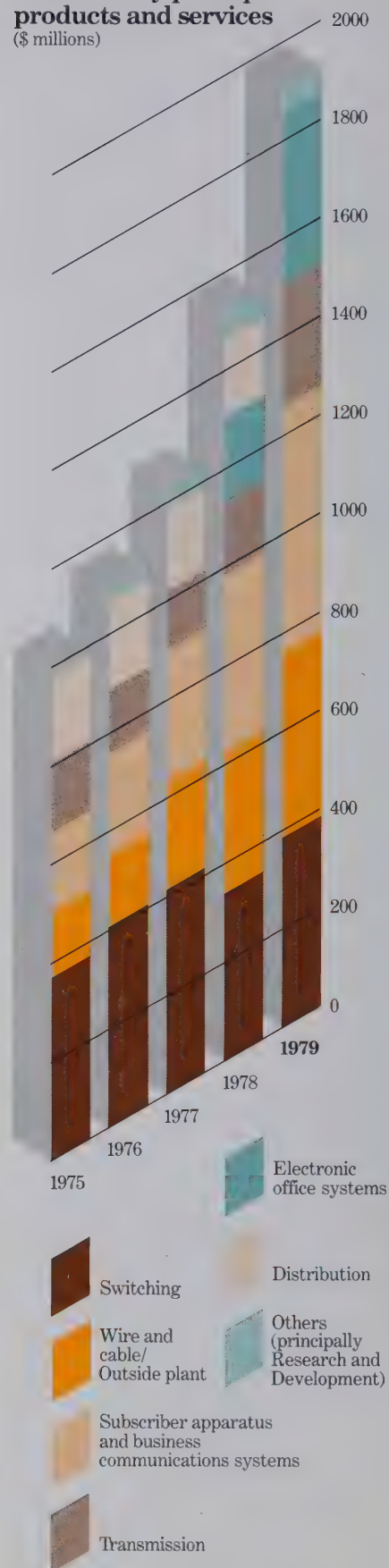
	1979	1978	1977	1976	1975
	(thousands of dollars)				
Sales to customers(1)					
Telecommunications equipment					
Central office switching.....	\$ 386,025	\$ 338,889	\$ 412,618	\$ 401,929	\$371,531
Subscriber apparatus and business communications systems.....	524,641	374,309	275,341	213,834	171,304
Wire, cable and outside plant..	366,738	276,572	215,127	145,984	126,588
Transmission	227,287	141,325	114,468	124,512	136,192
Discontinued lines.....	—	—	—	—	4,850
	1,504,691	1,131,095	1,017,554	886,259	810,465
Electronic office systems.....	349,823	171,513	—	—	—
Electrical & electronic products distribution(2)...	—	162,839	173,710	184,625	186,378
Other (principally research and development)(3)	46,008	39,113	30,658	12,607	—
Total	\$1,900,522	\$1,504,560	\$1,221,922	\$1,083,491	\$996,843
Operating earnings(1)					
Telecommunications equipment.....	\$ 234,500	\$ 180,901	\$ 184,549	\$ 168,018	\$155,231
Electronic office systems.....	26,017	30,020	—	—	—
Electrical & electronic products distribution(2)...	—	8,851	8,043	8,666	15,115
Other.....	1,680	—	—	—	—
Total	\$ 262,197	\$ 219,772	\$ 192,592	\$ 176,684	\$170,346

Notes:

- (1) Sales to customers, and operating earnings, which exclude general corporate expenses, have been restated for 1977 and prior years to conform with the presentation adopted in 1978.
- (2) Business discontinued effective on December 31, 1978.
- (3) Other includes sales of BNR, a non-profit-making research and development organization, from August 3, 1976.

Revenues by principal products and services

(\$ millions)



Consolidated statement of earnings (year ended December 31)

	1979	1978
	(thousands of dollars)	(thousands of dollars)
Sales (note 20)	\$1,900,522	\$1,504,560
Cost of sales	1,304,096	1,032,088
Gross profit	596,426	472,472
Selling, research and development, and general and administrative expenses (note 4)	412,591	326,759
Earnings from operations	183,835	145,713
Investment and other income (net) (note 5)	3,762	10,589
Interest charges—long-term debt	(26,432)	(13,781)
—other	(11,783)	(3,360)
Unrealized foreign currency gains (losses)	(426)	5,091
Earnings before underlisted items	148,956	144,252
Provision for income taxes (note 6)	35,484	49,868
Earnings before extraordinary items	113,472	94,384
Extraordinary items (note 7)	—	6,344
Net earnings	\$ 113,472	\$ 100,728
Earnings per share*		
—before extraordinary items	\$3.70	\$3.33
—after extraordinary items	\$3.70	\$3.55
Dividends declared per common share	\$0.85	\$0.74
*Based on weighted average number of common shares outstanding (thousands) ...	30,656	28,344

Consolidated statement of retained earnings (year ended December 31)

	1979	1978
	(thousands of dollars)	(thousands of dollars)
Balance at beginning of year	\$ 389,010	\$ 309,619
Net earnings	113,472	100,728
	502,482	410,347
Deduct: Dividends paid	26,155	21,337
Expenses of issue of capital stock, less applicable income taxes of \$1,975,000	2,673	—
	28,828	21,337
Balance at end of year	\$ 473,654	\$ 389,010

Consolidated balance sheet (as at December 31)

	1979	1978
	(thousands of dollars)	(thousands of dollars)
Assets		
Current		
Cash and short-term investments at cost (approximates market value)	\$ 6,750	\$ 17,243
Accounts receivable		
Affiliated companies	47,642	48,386
Other	376,792	264,648
Inventories (note 8)	492,539	361,402
Prepaid expenses	16,301	8,058
Deferred income taxes	37,858	29,332
	977,882	729,069
Long-term receivables (note 9)	41,296	44,932
Investments		
Non-consolidated subsidiaries (note 10a)	280,542	26,672
Associated companies (note 10b).....	16,485	14,399
Other	4,791	5,682
	301,818	46,753
Plant and equipment—net (note 11)	420,985	370,654
Goodwill and other assets (notes 1 and 18)	142,538	152,746
	\$1,884,519	\$1,344,154

On behalf of the Board of Directors:

James C. Thackray, Director

Charles Perrault, Director

	1979	1978
	(thousands of dollars)	(thousands of dollars)
Liabilities		
Current		
Due to banks	\$ —	\$ 22,882
Notes payable (note 12)	100,619	40,730
Accounts payable and accrued liabilities		
Affiliated companies	897	946
Other	266,023	250,640
Taxes payable	22,193	8,633
Due to non-consolidated subsidiaries (note 10a)	23,445	27,908
Long-term debt instalments due within one year (note 13)	7,780	10,057
	420,957	361,796
Deferred income	5,975	7,173
Due to non-consolidated subsidiaries (note 10a)	245,378	79,421
Long-term debt (note 13)	192,061	189,846
Deferred income taxes	90,942	73,296
Minority interest in subsidiary companies	11,591	56
	966,904	711,588
Shareholders' equity		
Capital stock (33,592,901 in 1979 and 29,592,901 in 1978 common shares outstanding without nominal or par value) (note 14)	443,961	243,556
Retained earnings	473,654	389,010
	917,615	632,566
	\$1,884,519	\$1,344,154

The integrity and objectivity of the financial statements and accompanying notes in the annual report are the responsibility of management.

To fulfill this responsibility, Northern Telecom maintains internal control systems to ensure that the books and records, from which the financial statements are derived accurately reflect all transactions and that established policies and procedures are followed. The internal control systems are supported by regular reviews by internal auditors and by examination of the financial statements by Touche Ross & Co., independent chartered accountants.

The Audit Committee of the Board of Directors meets regularly with the independent chartered accountants and with representatives of management and the internal auditors to approve the scope of audit work and to assess reports on audit work performed. The independent auditors have full access to the Audit Committee, with and without management present. The Audit Committee approves quarterly and annual financial statements and presents minutes of its meetings to the full Board of Directors for approval.

Consolidated statement of changes in financial position (year ended December 31)

	1979	1978
	(thousands of dollars)	(thousands of dollars)
Source of funds		
Operations:		
Earnings before extraordinary items	\$113,472	\$ 94,384
Items not requiring funds		
Depreciation and amortization	92,370	55,102
Amortization of goodwill.....	3,367	3,486
Deferred income taxes	17,646	25,807
Equity earnings in non-consolidated finance subsidiaries	(21,473)	—
Other	1,009	(2,563)
Total from operations.....	206,391	176,216
Extraordinary items (note 7)	—	6,344
Proceeds from long-term debt.....	330,305	138,638
Net proceeds from issuance of capital stock	197,732	—
Issuance of capital stock on acquisition (note 14)	—	84,574
Capital contribution by minority shareholders.....	10,328	—
Disposals of plant and equipment.....	33,637	15,036
Due to non-consolidated finance subsidiaries.....	165,957	79,421
Proceeds from sale of investments	4,502	—
Sale of long-term lease receivables to non-consolidated finance subsidiaries.....	3,636	10,775
	952,488	511,004
Application of funds		
Expenditures for plant and equipment.....	173,536	127,228
Reduction of long-term debt	328,090	111,367
Dividends	26,155	21,337
Investment in non-consolidated finance subsidiaries	233,835	23,712
Deferred income	1,198	(3,455)
Net non-current assets acquired (note 18)	—	178,438
Long-term receivables	—	17,075
Other	22	5,118
	762,836	480,820
Increase in working capital	189,652	30,184
Working capital at beginning of year	367,273	337,089
Working capital at end of year.....	\$556,925	\$367,273
The increase in working capital is accounted for by:		
Increase (decrease) in current assets:		
Cash and short-term investments	\$ (10,493)	\$ (87,919)
Accounts receivable.....	111,400	128,823
Inventories.....	131,137	142,965
Prepaid expenses	8,243	2,182
Deferred income taxes	8,526	14,345
(Increase) decrease in current liabilities:		
Notes payable and due to banks	(37,007)	(36,871)
Accounts payable and accrued liabilities.....	(15,334)	(100,972)
Taxes payable.....	(13,560)	5,027
Due to non-consolidated subsidiaries	4,463	(27,908)
Long-term debt instalments due within one year	2,277	(9,488)
Increase in working capital, as above	\$189,652	\$ 30,184

Condensed consolidated statement of earnings

	1979	1978	1977	1976	1975
(dollar amounts in millions except per share figures)					
Sales	\$1,900.5	\$1,504.6	\$1,221.9	\$1,083.5	\$ 996.8
Cost of sales	(1,304.1)	(1,032.1)	(873.2)	(781.4)	(725.4)
Operating expenses	(412.6)	(326.8)	(227.4)	(183.8)	(149.4)
Earnings from operations	183.8	145.7	121.3	118.3	122.0
Investment and other income (net)	3.8	10.6	9.5	11.7	3.9
Unrealized foreign currency gains (losses)	(.4)	5.1	6.0	1.8	(.6)
Interest charges	(38.2)	(17.1)	(6.6)	(6.8)	(8.3)
Provision for income taxes	(35.5)	(49.9)	(48.3)	(51.1)	(46.8)
Earnings before extraordinary items	113.5	94.4	81.9	73.9	70.2
Extraordinary items*	—	6.3	3.4	3.2	(2.7)
Net earnings	\$ 113.5	\$ 100.7	\$ 85.3	\$ 77.1	\$ 67.5
Earnings per share**					
—before extraordinary items	\$ 3.70	\$ 3.33	\$ 3.09	\$ 2.79	\$ 2.65
—after extraordinary items	\$ 3.70	\$ 3.55	\$ 3.22	\$ 2.91	\$ 2.55
An analysis of continuing and discontinued operations resulting from:					
i) the termination of the semiconductor business of Microsystems International Limited including an extraordinary item in 1975					
ii) the termination of the electrical and electronic products distribution business of Nedco Ltd. including an extraordinary item in 1978 is as follows:					
Sales:					
Continuing operations		\$1,365.9	\$1,074.3	\$ 925.6	\$ 832.6
Discontinued operations		138.7	147.6	157.9	164.2
		\$1,504.6	\$1,221.9	\$1,083.5	\$ 996.8
Net earnings:					
Continuing operations		\$ 102.5	\$ 83.4	\$ 73.5	\$ 67.4
Discontinued operations		(1.8)	1.9	3.6	.1
		\$ 100.7	\$ 85.3	\$ 77.1	\$ 67.5
Earnings per share**					
Continuing operations		\$ 3.61	\$ 3.15	\$ 2.77	\$ 2.55
Discontinued operations		(0.06)	0.07	0.14	—
		\$ 3.55	\$ 3.22	\$ 2.91	\$ 2.55
*Net of income taxes and minority interest					
**Based on weighted average number of common shares outstanding (thousands)					
	30,656	28,344	26,469	26,469	26,433

Consolidated ten-year review

	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970
	(millions of dollars)									
Earnings and related data										
Total revenues	\$1,900.5	\$1,504.6	\$1,221.9	\$1,083.5	\$ 996.8	\$ 957.7	\$ 608.1	\$ 531.3	\$ 573.8	\$ 561.8
Revenues of company manufactured products..	1,854.5	1,330.1	1,047.1	922.1	843.7	799.8	512.9	448.5	473.4	462.1
Depreciation on plant and equipment.....	88.4	52.5	30.9	24.1	23.3	25.4	16.2	12.8	11.6	12.3
Research and development expenses...	132.6	97.8	68.2	61.4	49.0	44.0	32.7	28.0	29.7	31.0
Interest charges.....	38.2	17.1	6.6	6.8	8.3	7.7	6.5	5.6	5.7	5.1
Provision for income taxes*	35.5	36.7	44.9	48.0	44.7	49.6	30.5	21.0	14.5	5.3
Net earnings	113.5	100.7	85.3	77.1	67.5	53.8	32.0	20.1	12.6	4.1
Earnings per sales dollar (cents)	6.0	6.7	7.0	7.1	6.8	5.6	5.3	3.8	2.2	.7
Earnings per share (dollars).....	3.70	3.55	3.22	2.91	2.55	2.05	1.35	0.85	0.54	0.17
Dividends per share (dollars).....	0.85	0.74	0.66	0.61	0.60	0.525	0.50	0.50	0.50	0.38
Financial position at December 31										
Working capital.....	556.9	367.3	337.1	307.6	284.9	281.4	209.7	175.3	176.9	188.4
Plant & equipment (at cost).....	692.7	602.1	388.8	360.1	284.5	273.4	257.3	233.8	226.7	230.2
Accumulated depreciation..	271.7	231.5	203.1	189.2	162.7	156.6	141.3	127.6	123.8	124.9
Capital expenditures.....	173.5	127.2	44.7	38.2	31.7	33.2	26.3	19.1	21.6	20.5
Long-term debt**	192.0	189.8	52.4	58.3	67.8	104.5	69.6	73.5	77.1	79.0
Shareholders' equity	917.6	632.6	468.6	400.8	339.9	285.2	245.0	192.1	183.8	183.0
Employees at December 31	33,301†	31,756†	24,962	25,277	23,751	26,147	25,073	20,787	23,230	24,986
Compensation										
Payroll.....	651.8	482.9	395.3	347.2	325.0	301.2	214.1	192.2	199.8	206.2
Benefits	108.1	93.3	75.0	58.0	45.0	41.2	35.1	30.0	28.5	25.4
Total.....	\$ 759.9	\$ 576.2	\$ 470.3	\$ 405.2	\$ 370.0	\$ 342.4	\$ 249.2	\$ 222.2	\$ 228.3	\$ 231.6

*includes income tax effects of extraordinary items.

**excludes long-term debt of non-consolidated finance subsidiaries incorporated in 1978 and 1979.

†excludes NETAS employees

Notes to the consolidated financial statements

1. Accounting policies

The accompanying financial statements have been prepared in accordance with Canadian generally accepted accounting principles. With respect to Northern Telecom Limited (the corporation) and its subsidiary companies, the only important difference between Canadian and United States generally accepted accounting principles is the accounting for translation of foreign currency transactions and financial statements of foreign subsidiary companies as described in note 2. Another difference is the financial statement presentation of the results of the disposal of a segment of the business, as described in note 3.

a) Principles of consolidation

The consolidated financial statements include the accounts of the corporation and all subsidiary companies except NETAS-Northern Electric Telekomünikasyon, A.S. (NETAS) and the finance subsidiaries, which are accounted for on the equity basis. When stock ownership and control of subsidiary companies is acquired, the earnings of these companies is included in the consolidated financial statements since the date of acquisition of control.

NETAS (51 percent owned) is accounted for on the equity method as the corporation is required to reduce its holdings in NETAS to below 50 percent.

The finance subsidiaries are not consolidated as their business is fundamentally different from that of the consolidated group. In the consolidated statement of earnings, the earnings from operations of the finance subsidiaries reduce long-term interest charges; unrealized foreign currency losses and income taxes are included in the respective captions.

The directly owned subsidiary companies at December 31, 1979 were:

	Percentage ownership
Nedco Ltd.	100(1)
Nedco (1975) Ltd.	100
Microsystems International GmbH, Germany	100
Zentronics Ltd.	100(1)
Nevron Investments Limited.	100
Cook Electric Company of Canada Ltd.	100
Cook Electric do Brasil Telecomunicações Ltda, Brazil	100
Northern Telecom (Ireland) Limited, Ireland	100
NETAS-Northern Electric Telekomünikasyon, A.S., Republic of Turkey	51
Northern Telecom International Finance B.V., the Netherlands.	100
Northern Telecom Canada Limited	100
Northern Telecom (Europe) B.V., the Netherlands.	100
Northern Telecom (International) B.V., the Netherlands.	100
Bell-Northern Research Ltd.	70(2)
Northern Telecom Industries Sdn. Bhd., Malaysia	100
Northern Telecom International Limited.	100
Northern Telecom Industries, Inc., U.S.A.	100

(1) All of the inventories and certain of the fixed assets of these subsidiaries in the electrical and electronic products distribution business were disposed of in January 1979. (See note 3)

(2) The balance is owned by Bell Canada.

b) Translation of foreign currencies

Current assets (excluding inventories and prepaid expenses), current liabilities and long-term monetary assets and liabilities are translated at the rates in effect at the balance sheet date, whereas other assets (including inventories and prepaid expenses) and other liabilities are translated at rates prevailing at the respective transaction dates. Revenues and expenses are translated at average rates prevailing during the year except for cost of inventory used, depreciation and amortization which are translated at exchange rates prevailing when the related assets were manufactured or acquired. Currency gains and losses are reflected in net earnings of the year, except for unrealized currency gains and losses on long-term monetary assets and liabilities which are amortized over the remaining lives of the related items.

c) Rental revenue

For operating leases, rental revenue is recognized when billed to customers. For leases which qualify as sales-type leases, the present value of future rental payments is recorded as sales revenue at the inception of the lease.

d) Depreciation

Depreciation is calculated generally on the straight-line method using rates based on the expected useful lives of the respective assets as follows:

Buildings 20 to 40 years; machinery and equipment 3 to 16 years; and equipment for lease to customers 4 years.

e) Research and development

Research and development expenditures are charged to earnings in the years in which they are incurred, except for expenditures incurred pursuant to specific contracts for the manufacture of telecommunications equipment, which are charged to earnings in the same period as the related revenue is recognized.

f) Income taxes

The corporation and its subsidiary companies follow the practice of providing for income taxes based on taxable income included in the financial statements regardless of when such income is subject to payment of taxes under the tax laws.

g) Maintenance and repairs

The cost of maintenance and repairs of plant and equipment is charged to earnings in the years in which they are incurred.

h) Inventories

Inventories are valued at the lower of cost (calculated generally on a first-in, first-out basis) and net realizable value. The cost of finished goods and work-in-process inventories is comprised of material, labor and manufacturing overhead.

i) Goodwill

Goodwill represents the unamortized excess of the acquisition costs over the net assets of subsidiary companies and is amortized over periods not exceeding 40 years. Amortization charged to earnings for the years ended December 31, 1979 and 1978 was \$3,367,000 and \$3,486,000, respectively. The unamortized goodwill as at December 31, 1979 and 1978 was \$107,986,000 and \$116,088,000, respectively.

2. Translation of foreign currencies

If the financial statements had been prepared as required in the United States by the Financial Accounting Standards Board, net earnings as reported would have been increased by \$2,819,000 (\$0.09 per share) in 1979 and reduced by \$3,529,000 (\$0.12 per share) in 1978.

3. Disposal of segments of a business

All of the inventories and certain of the fixed assets of the corporation's subsidiaries in the electrical and electronic products distribution business were sold in January 1979. These financial statements were prepared to reflect the sale and discontinuance of that business effective as of December 31, 1978.

Under U.S. practices the disposal of a segment of a business requires different reporting; however, earnings and earnings per common share would be identical under both Canadian and U.S. reporting practices. The classification of these items as a "disposal of segments of a business" under U.S. reporting practices would have resulted in the following revised figures in the consolidated statement of earnings:

	1978
Sales as reported	\$1,504,560,000
Less: sales of discontinued operations	138,637,000
Sales of continuing operations	\$1,365,923,000
Earnings from continuing operations	\$ 102,482,000
Earnings from discontinued operations	(1,754,000)(1)
Earnings	\$ 100,728,000
Earnings per share (after extraordinary items)	
—from continuing operations	\$3.61
—from discontinued operations	(0.06)
Earnings per share	\$3.55

(1) Includes a provision for loss of \$3,192,000 (see note 7) which is reported as an extraordinary item under Canadian reporting practices. Under U.S. reporting practices, this loss would be separately disclosed in earnings before extraordinary items.

Software specialists are one of the fastest growing segments of Northern Telecom's workforce. The corporation recruits experts in the design of software from all over the world.



4. Research and development

Research and development expenditures for the years ended December 31, 1979 and 1978 amounted to \$178,498,000 and \$135,467,000, respectively. These expenditures included the costs of research and development to customers of Bell-Northern Research Ltd. and B-N Software Research Inc., principally Bell Canada, and costs expended pursuant to specific contracts for the manufacture of telecommunications equipment which are accounted for as contract costs. The net expense of research and development to the corporation was \$132,639,000 and \$97,835,000 for the years ended December 31, 1979 and 1978, respectively.

5. Investment and other income (net)

Investment and other income (net) includes equity in the net earnings of a non-consolidated subsidiary and of associated companies of \$2,443,000 and \$3,828,000 for the years ended December 31, 1979 and 1978, respectively.

6. Provision for income taxes

A reconciliation of the statutory income tax rates in Canada to the effective income tax rates for the year ended December 31, is as follows:

	1979		1978	
Canadian income taxes at statutory rate including provincial income taxes	\$72,839,000	48.9%	\$69,962,000	48.5%
Reduction of Canadian taxes applicable to:				
Manufacturing profits	(6,914,000)	(4.6)	(6,360,000)	(4.4)
Research and development credits	(13,183,000)	(8.9)	(5,408,000)	(3.8)
Inventory credit	(2,926,000)	(2.0)	(2,487,000)	(1.7)
Non-taxable portion of unrealized foreign currency gains	(26,000)	—	(2,196,000)	(1.5)
Difference between Canadian statutory rates and those applicable to foreign subsidiaries	(15,924,000)	(10.6)	(613,000)	(0.4)
Other	1,618,000	1.0	(3,030,000)	(2.1)
	\$35,484,000	23.8%	\$49,868,000	34.6%

Details of provision for income taxes are as follows:

Current	\$31,882,000	\$40,463,000
Deferred	3,602,000	9,405,000
Total provision for income taxes	\$35,484,000	\$49,868,000
Canadian	\$32,322,000	\$36,349,000
Foreign (principally U.S.)	3,162,000	13,519,000
Total provision for income taxes	\$35,484,000	\$49,868,000

7. Extraordinary items

	1979	1978
Reduction of income taxes arising from the use of prior years' losses of a subsidiary company	—	\$ 9,536,000
Provision for costs of terminating the electrical and electronic products distribution business, less applicable income taxes of \$3,648,000	—	(3,192,000)
	—	\$ 6,344,000

8. Inventories

At December 31, inventories consisted of the following:

	1979	1978
Raw materials	\$167,553,000	\$118,400,000
Work in process	164,697,000	135,490,000
Finished goods	160,289,000	107,512,000
	\$492,539,000	\$361,402,000

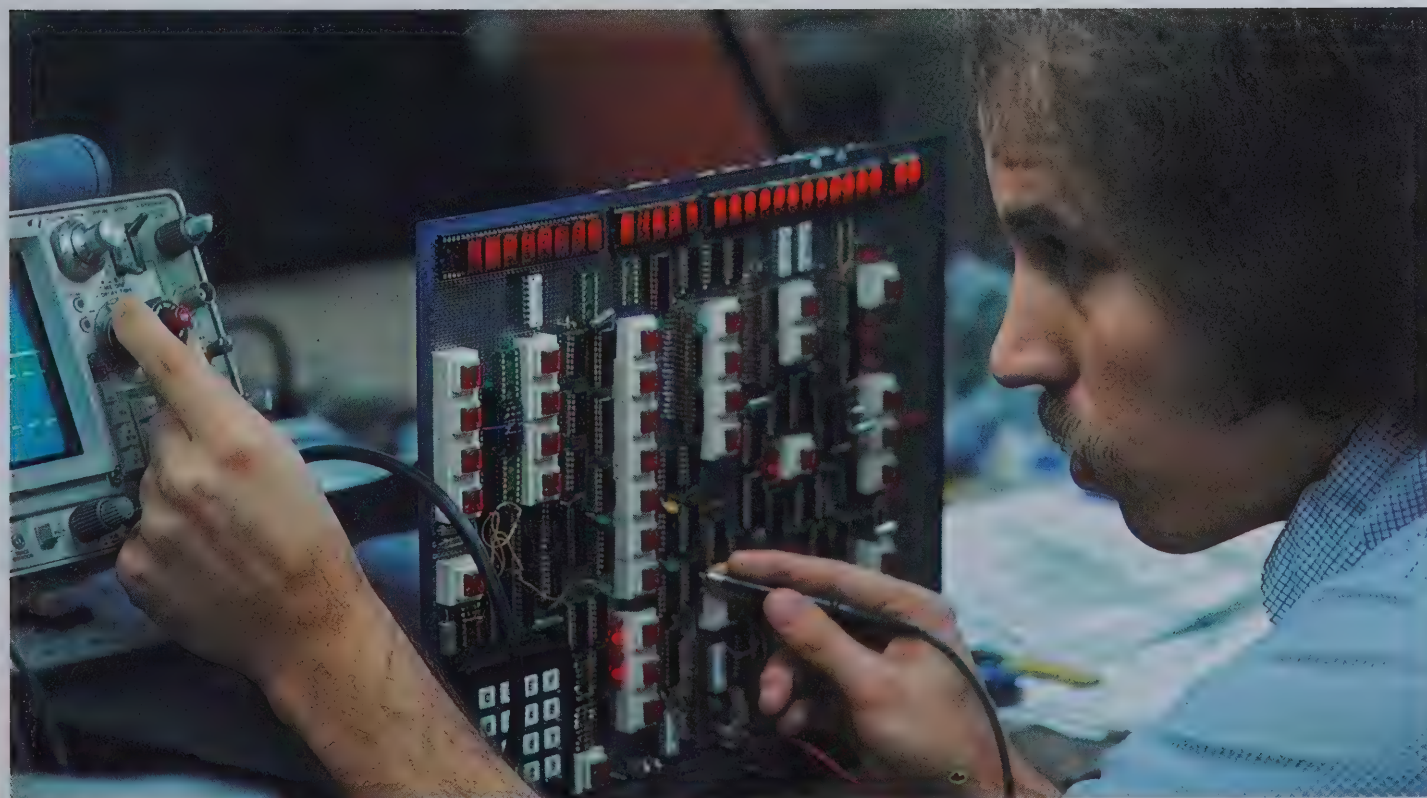
9. Long-term receivables and lease commitments (corporation as lessor)

At December 31, 1979, amounts due to the corporation and consolidated subsidiaries under non-cancellable leases and instalment receivables are as follows:

	Operating leases	Sales-type leases and instalment receivables
1980.....	\$ 17,323,000	\$ 26,787,000
1981.....	3,484,000	26,363,000
1982.....	391,000	9,772,000
1983.....	101,000	4,450,000
1984.....	3,000	1,859,000
Thereafter	—	1,613,000
	<u>\$ 21,302,000</u>	<u>\$ 70,844,000</u>
Less: unearned income		6,535,000
current portion		23,013,000
		<u>\$ 41,296,000</u>

Certain of the rights to receive revenue under operating and sales-type leases have been sold to finance subsidiaries and are not included above (see note 10).

Effective service and systems support is imperative in the electronic office equipment industry. At Northern Telecom Systems Corporation in Minnetonka, Minnesota, an engineer tests a printed circuit board which will assist in solving hardware and software problems of multifunction terminal systems.



10. Investments in non-consolidated subsidiaries and an associated company:

The following information relates to the investments carried on the equity basis.

a) Non-consolidated subsidiaries

i) Non-consolidated finance company subsidiaries

In December 1978 and June 1979 finance subsidiaries were incorporated and purchased from other subsidiaries of the corporation rights to receive rental revenues and other income. Such other subsidiaries of the corporation will continue to collect such rental revenues on behalf of the finance company subsidiaries. The finance company subsidiaries commenced operations in January 1979. The following is a summary of the combined assets and liabilities of the finance company subsidiaries at December 31:

	1979	1978
Assets		
Rights to receive rental revenue under:		
Sales-type leases	\$ 20,048,000	\$ 17,514,000
Operating leases.....	73,977,000	107,329,000
Inter-group loans	194,846,000	—
Other	590,000	—
	\$289,461,000	\$124,843,000
Liabilities		
Accrued liabilities	\$ 4,609,000	\$ —
Notes payable to banks due December 31, 1986 bearing interest at 15.125% on December 31, 1979	5,832,000	101,131,000
Shareholders' equity	279,020,000	23,712,000
	\$289,461,000	\$124,843,000

The following is a summary of their combined operations for the year ended December 31, 1979, which was their first year of operations.

Interest income.....	\$ 32,934,000
Interest expense	(5,571,000)
Administrative expenses.....	(635,000)
Earnings from operations.....	26,728,000
Unrealized foreign currency losses	(887,000)
Provision for income taxes.....	(4,368,000)
Net earnings	\$ 21,473,000

Amounts due to finance subsidiaries under non-cancellable leases as at December 31, 1979 are as follows:

	Operating leases	Sales-type leases
1980	\$ 11,038,000	\$ 7,765,000
1981	3,526,000	8,328,000
1982	1,459,000	4,621,000
1983	371,000	1,224,000
1984	36,000	298,000
Thereafter	—	27,000
	\$ 16,430,000	22,263,000
Less: unearned income		2,215,000
		\$ 20,048,000

*Finishing touches are
made to a printed circuit board
at the Brampton, Ontario
switching plant.*

ii) *NETAS*

A condensed summary of financial data for NETAS is as follows:

	1979	1978
Total assets	\$ 43,163,000	\$ 31,573,000
Total liabilities	\$ 35,609,000	\$ 20,734,000
Investment at equity	\$ 1,522,000	\$ 2,960,000
Gross revenues	\$ 36,182,000	\$ 32,471,000

b) Associated company

Included in investments in associated companies is an investment in Intersil, Inc., 21.9% of which is owned by a subsidiary of the corporation. The excess of the cost of the investment (\$11,616,000) over the equity in the underlying net tangible assets amounted to \$3,230,000 at December 31, 1979. The market value of the investment at December 31, 1979 was \$38,714,000.

11. Plant and equipment

At December 31, plant and equipment consisted of the following:

	1979	1978
Cost		
Land	\$ 14,244,000	\$ 13,687,000
Buildings	103,651,000	95,876,000
Machinery and equipment	471,873,000	393,561,000
Equipment for lease to customers	77,962,000	78,600,000
Property under capital leases	24,982,000	20,400,000
	692,712,000	602,124,000
Less: Accumulated depreciation and amortization		
Buildings	29,864,000	27,727,000
Machinery and equipment	228,830,000	196,505,000
Equipment for lease to customers	8,508,000	5,022,000
Property under capital leases	4,525,000	2,216,000
	271,727,000	231,470,000
	\$420,985,000	\$370,654,000



12. Notes payable

The following information relates to aggregate commercial paper borrowing, largely with maturities ranging up to 90 days:

	1979	1978
Amount outstanding at December 31	\$100,619,000	\$ 40,730,000
Maximum amount outstanding at any month-end during the year ended December 31.....	\$100,619,000	\$ 48,136,000
Average amount outstanding during the year ended December 31.....	\$ 61,561,000	\$ 37,940,000
Weighted average annual interest rate during the year ended December 31.....	11.63%	8.05%
Weighted average interest rate at December 31	13.66%	10.59%

13. Long-term debt

	1979	1978
Sinking fund debentures		
5¾% 1962 Series due December 15, 1982.....	\$ 5,734,000	\$ 6,784,000
6½% Series C due April 15, 1986	3,693,000	4,693,000
9¾% Series D due April 30, 1990.....	28,000,000	29,177,000
	37,427,000	40,654,000
Revolving bank loan of the corporation (U.S. dollars) bearing interest at a rate based on the London interbank offered rate. At December 31, 1979 the effective rate was 14.55%	85,147,000	—
Debentures of Bell-Northern Research Ltd. and B-N Software Research Inc. payable to Bell Canada.....	459,000	9,190,000
Notes payable to banks by United States subsidiaries (U.S. dollars) bearing interest at 13.74% on December 31, 1979	850,000	65,445,000
Revolving bank credit loans of European subsidiaries (various currencies) bearing interest at an average rate of 10.6%	40,084,000	40,556,000
7% Instalment notes (U.S. dollars)	13,452,000	18,472,000
Obligations under capital leases	21,180,000	18,125,000
Other	1,242,000	7,461,000
	199,841,000	199,903,000
Less amount included in current liabilities	7,780,000	10,057,000
	\$192,061,000	\$189,846,000

At December 31, 1979, the amount of long-term debt payable, including net sinking fund requirements, in the years 1980 through 1984 was \$7,780,000, \$47,754,000, \$11,953,000, \$19,522,000 and \$19,358,000, respectively.

14. Capital stock

The corporation has an unlimited number of authorized shares, with no limit to the consideration to be received by it upon issue of such shares.

Outstanding shares at December 31, and consideration received were:

	1979		1978	
	Shares	\$	Shares	\$
January 1.....	29,592,901	\$243,556,000	26,469,494	\$158,982,000
Issued during the year.....	4,000,000	200,405,000	3,123,407	84,574,000
December 31.....	33,592,901	\$443,961,000	29,592,901	\$243,556,000

On September 25, 1979, the corporation sold 4,000,000 common shares for an aggregate consideration of \$200,405,000. Bell Canada purchased 2,000,000 common shares and 2,000,000 common shares were sold to the public.

On May 26, 1978, the corporation issued 3,123,407 common shares for an aggregate consideration of \$84,574,000 as a result of a merger of Sycor, Inc. with a wholly owned subsidiary of the corporation.

At December 31, 1979, 750,000 common shares were reserved for issuance under the shareholder Dividend Reinvestment and Stock Purchase Plan.

15. Plans for employees' pensions

The corporation and certain of its subsidiary companies have pension plans which provide pensions generally based on length of service and rates of pay. The most significant of these are the corporation's pension plans for Canadian and U.S. employees. The actuarial valuation of these plans as of January 1, 1979 indicated that the total assets of the plans exceeded the vested benefits.

The cost of the plans charged to earnings for the years ended December 31, 1979 and 1978 was \$43,808,000 and \$34,551,000, respectively.

16. Leased property and commitments

The classification of future minimum lease payments under capital and operating leases as at December 31, 1979 is as follows:

	Capital	Operating
Year ending December 31		
1980	\$ 4,906,000	\$ 10,612,000
1981	4,668,000	7,814,000
1982	3,920,000	5,187,000
1983	3,208,000	4,290,000
1984	3,186,000	3,934,000
Thereafter	38,739,000	21,692,000
Total commitments	\$ 58,627,000	\$ 53,529,000

Included in capital lease commitments are amounts representing estimated executory costs of \$10,765,000 and interest of \$26,682,000. Future sublease rentals related to operating leases are \$1,231,000.

Rental expense on operating leases amounted to \$25,522,000 and \$20,353,000 for the years ended December 31, 1979 and 1978, respectively.

More than \$30 million has been spent on the development of LSIs at Bell-Northern Research laboratories in Ottawa, Ontario.



17. Quarterly financial data (unaudited)

Summarized consolidated quarterly financial data for 1979 and 1978 is as follows:

	(dollars in millions except per share figures)							
	4th quarter		3rd quarter		2nd quarter		1st quarter	
	1979	1978	1979	1978	1979	1978	1979	1978
Sales	\$515.2	\$484.1	\$433.6	\$371.6	\$530.0	\$353.5	\$421.7	\$295.4
Gross profit	\$167.1	\$162.7	\$130.5	\$119.0	\$162.4	\$106.7	\$136.4	\$ 84.1
Earnings before extraordinary items.....	\$ 35.1	\$ 31.0	\$ 22.1	\$ 20.1	\$ 31.3	\$ 26.4	\$ 25.0	\$ 16.9
Net earnings	\$ 35.1	\$ 30.3	\$ 22.1	\$ 22.4	\$ 31.3	\$ 28.8	\$ 25.0	\$ 19.2
Earnings per share*								
—before extraordinary items	\$ 1.06	\$ 1.06	\$ 0.74	\$ 0.67	\$ 1.06	\$ 0.96	\$ 0.84	\$ 0.64
—after extraordinary items	\$ 1.06	\$ 1.03	\$ 0.74	\$ 0.75	\$ 1.06	\$ 1.04	\$ 0.84	\$ 0.73
Weighted average number of shares (thousands).....	33,593	29,593	29,810	29,593	29,593	27,705	29,593	26,469

*If U.S. generally accepted accounting principles had been used for a) translation of foreign currencies; b) the allocation between quarters of the reduction of income taxes arising from the use of prior years' losses of a subsidiary company; and c) the presentation of the provision for loss on discontinuance of a business, earnings per share before and after extraordinary items would have been:

	4th quarter		3rd quarter		2nd quarter		1st quarter	
	1979	1978	1979	1978	1979	1978	1979	1978
Earnings per share								
—before extraordinary items	\$ 1.03	\$ 1.08	\$ 0.75	\$ 0.42	\$ 1.01	\$ 0.96	\$ 1.00	\$ 0.64
—after extraordinary items	\$ 1.03	\$ 1.06	\$ 0.75	\$ 0.42	\$ 1.01	\$ 1.09	\$ 1.00	\$ 0.86

18. Acquisitions

On January 5, 1978, a subsidiary of the corporation merged with Danray, Inc. (Danray). The transaction, which has been accounted for as a purchase, was effected at a cost of \$25,162,000 in cash.

On May 26, 1978, a subsidiary of the corporation merged with Sycor, Inc. (Sycor). The transaction, which has been accounted for as a purchase, was effected at a cost of \$84,574,000 by the issuance of 3,123,407 common shares of the corporation.

A tender offer was made by a subsidiary of the corporation for the common shares and convertible debentures of Data 100. As a result of the offer, which closed on August 4, 1978, and a subsequent merger agreement effective November 22, 1978, the corporation's interest in the capital stock of Data 100 increased to 100%. The acquisition, which has been accounted for as a purchase, was effected principally in cash at a cost of \$163,893,000, including consideration paid prior to the tender offer.

In November 1978 a subsidiary of the corporation purchased all the outstanding common shares of Eastern Data Industries, Inc. (Spectron). The acquisition, which has been accounted for as a purchase, was effected at a cost of \$20,995,000 in cash and notes.

The net assets obtained were as follows:

Net plant and equipment acquired.....	\$125,251,000
Other non-current assets.....	77,571,000
	202,822,000
Deduct: Long-term debt	\$110,199,000
Other non-current liabilities	3,776,000
	113,975,000
	88,847,000
Goodwill	108,354,000
Net non-current assets acquired	197,201,000
Working capital acquired.....	98,569,000
	295,770,000
Deduct: Investment in Data 100 as at December 31, 1977	18,763,000
Total consideration for acquisitions in 1978	\$277,007,000

The following pro forma data presents the consolidated sales and net earnings of the corporation for the year ended December 31, 1978 as if Danray, Sycor, Data 100 and Spectron had been acquired effective January 1, 1978.

Sales.....	\$1,654,969,000
Earnings before extraordinary items.....	\$90,972,000
Net earnings	\$97,316,000
Earnings per share	
—before extraordinary items.....	\$3.07
—after extraordinary items.....	\$3.29

19. Replacement cost data—unaudited

The corporation has developed estimates of the replacement cost of productive capacity, inventories, cost of sales and depreciation expense in compliance with rules and guidelines issued by the United States Securities and Exchange Commission.

The establishment of the estimates involved numerous assumptions. Accordingly, they must be recognized as being imprecise and caution in their use is recommended. In particular, the corporation recommends that they not be used to adjust reported net earnings because the estimates do not cover all assets, liabilities, revenues and expenses and, therefore, the estimates are incomplete. In addition, the estimates of replacement cost data do not reflect any operating cost savings which may result from the replacement of the existing assets based on improvements in technology (based on experience, it is the opinion of management, that such operating cost savings could be significant; it is not possible at this time to quantify such cost savings with reasonable accuracy). The above considerations, together with other factors such as the cost of additional financing, if necessary, and income tax considerations, make it misleading to recalculate net earnings on the basis of the following estimates.

The corporation cautions that the replacement cost data presented below are not the current value of existing productive capacity and inventories. They are only estimates of the cost that would be incurred if the productive capacity and inventories were replaced at cost levels existing at December 31, 1979 and 1978, and accordingly the actual cost of replacement at some time in the future may differ significantly.

	1979		1978	
	Historic cost	Estimated replacement cost	Historic cost	Estimated replacement cost
Productive capacity subject to replacement cost	\$ 662,000,000	\$1,048,000,000	\$ 577,000,000	\$ 997,000,000
Less: accumulated depreciation	268,000,000	526,000,000	225,000,000	489,000,000
	\$ 394,000,000	\$ 522,000,000	\$ 352,000,000	\$ 508,000,000
Land and other property at historic cost, net of depreciation	\$ 27,000,000	\$ 27,000,000	\$ 19,000,000	\$ 19,000,000
Inventories	\$ 493,000,000	\$ 507,000,000	\$ 361,000,000	\$ 373,000,000
Cost of sales (including depreciation)	\$1,304,000,000	\$1,337,000,000	\$1,032,000,000	\$1,043,000,000
Depreciation expense				
Included in cost of sales.....	\$ 76,000,000	\$ 92,000,000	\$ 48,000,000	\$ 59,000,000
Included in operating expenses.....	12,000,000	13,000,000	5,000,000	6,000,000
	\$ 88,000,000	\$ 105,000,000	\$ 53,000,000	\$ 65,000,000

The foregoing replacement cost data were estimated as follows:

Gross productive capacity—current acquisition costs or indices specifically developed for several major categories were used. Present business conditions, current technology and the corporation's normal approach to replacement of capacity were assumed.

Accumulated depreciation—the relationship between historic original cost and accumulated depreciation was applied to the gross replacement cost of machinery and equipment.

Inventories—historic cost was adjusted to reflect current cost of material, labor and manufacturing overhead.

Cost of sales—historic cost was adjusted for the increase in costs between time of purchase or manufacture and the time of sale.

Depreciation expense—on the straight-line basis using the same useful lives for the assets as is used in the historic cost financial statements.

20. Information on business segments and geographic areas

Business segments (as approved by the Board of Directors)

Northern Telecom operates in two major businesses: (1) telecommunications equipment which involves the design, manufacture and sale of central office switching equipment, subscriber apparatus and business communications systems, transmission equipment and wire, cable and related outside plant products; and (2) electronic office systems which involves the design, manufacture and marketing of computer terminals and peripheral equipment. In addition, Northern Telecom has a non-profit-making research and development organization, BNR, which undertakes the major part of the research activities of Northern Telecom and Bell Canada including research, design, development, long-range planning and systems engineering in all phases of telecommunications. In 1978 and prior years, Northern Telecom operated in a third major business, electrical and electronic products distribution; this was discontinued as of December 31, 1978 as described in note 3. The following table sets forth information concerning the business segments for the years ended December 31, 1979, 1978 and 1977.

Business segments by industry	1979	1978	1977
<i>Total sales</i>	(dollars in millions)		
Telecommunications equipment			
Sales to customers*	\$1,504.7	\$1,131.1	\$1,017.5
Intersegment sales	2.5	27.3	27.1
	1,507.2	1,158.4	1,044.6
Electronic office systems			
Sales to customers	349.8	171.5	—
Intersegment sales	.3	.2	—
	350.1	171.7	—
Electrical and electronic products distribution			
Sales to customers	—	162.9	173.7
Intersegment sales	—	4.5	4.6
	—	167.4	178.3
Other			
Sales to customers	46.0	39.1	30.7
Intersegment sales	68.2	74.5	54.6
	114.2	113.6	85.3
Adjustments and eliminations	(71.0)	(106.5)	(86.3)
Total sales to customers	\$1,900.5	\$1,504.6	\$1,221.9
<i>Operating earnings</i>			
Telecommunications equipment	\$234.5	\$ 180.9	\$ 184.6
Electronic office systems	26.0	30.0	—
Electrical and electronic products distribution	—	8.9	8.0
Other	1.7	—	—
	262.2	219.8	192.6
<i>Equity earnings</i>			
Telecommunications equipment	—	.6	1.3
Electronic office systems	—	1.1	—
Other	2.4	2.1	.7
	2.4	3.8	2.0
Other income (expense)	(37.2)	(5.3)	6.8
General corporate expenses	(78.4)	(74.0)	(71.3)
Earnings before income taxes and extraordinary items	\$ 149.0	\$ 144.3	\$ 130.1
<i>Identifiable assets</i>			
Telecommunications equipment	\$ 983.5	717.7	\$ 510.5
Electronic office systems	503.8	433.6	—
Electrical and electronic products distribution	—	50.7	51.4
Other	76.3	64.3	52.3
Adjustments and eliminations	(53.8)	(23.1)	(16.6)
	1,509.8	1,243.2	597.6
<i>Investment in non-consolidated subsidiaries and associated companies</i>			
Telecommunications equipment	1.7	3.0	2.2
Electronic office systems	—	—	18.8
Not identifiable with a business segment	295.3	38.1	12.3
Total investment	297.0	41.1	33.3
Corporate assets	77.7	59.9	129.2
Total assets as at December 31	\$1,884.5	\$1,344.2	\$ 760.1
	Depreciation		
	1979	1978	1977
	Capital expenditures		
	1979	1978	1977
<i>Depreciation and capital expenditures</i>			
Telecommunications equipment	\$33.6	\$25.6	\$23.6
Electronic office systems	43.7	17.8	—
Electrical and electronic products distribution	—	.5	.4
Other	7.7	6.0	5.2
Corporate	3.4	2.6	1.7
Total	\$88.4	\$52.5	\$30.9
	\$173.5	\$127.2	\$44.7

Geographic areas

The following table sets forth information about operations in different geographic areas for the years ended December 31, 1979, 1978 and 1977.

Business segments by geographic area	1979	1978	1977
	(dollars in millions)		
<i>Total sales</i>			
Canada			
Sales to customers*	\$1,000.8	\$1,007.9	\$1,014.4
Transfers between geographic areas	66.9	86.0	44.4
	1,067.7	1,093.9	1,058.8
United States			
Sales to customers	739.6	447.1	193.5
Transfers between geographic areas	20.5	19.8	6.5
	760.1	466.9	200.0
Other			
Sales to customers	160.1	49.6	14.0
Transfers between geographic areas	—	.9	5.9
	160.1	50.5	19.9
Adjustments and eliminations	(87.4)	(106.7)	(56.8)
Total sales to customers	\$1,900.5	\$1,504.6	\$1,221.9
<i>Operating earnings</i>			
Canada	\$ 239.4	\$ 223.5	\$ 227.2
United States	131.9	86.8	29.1
Other	24.8	7.2	2.9
Adjustments and eliminations	(1.3)	.1	1.6
Operating earnings before research and development expenses	394.8	317.6	260.8
Research and development expenses	(132.6)	(97.8)	(68.2)
Operating earnings	262.2	219.8	192.6
Non-operating expenses less other income**	(34.8)	(1.5)	8.8
General corporate expenses	(78.4)	(74.0)	(71.3)
Earnings before income taxes and extraordinary items	\$ 149.0	\$ 144.3	\$ 130.1
<i>Identifiable assets</i>			
Canada	\$ 573.3	532.2	\$ 462.0
United States	861.5	598.6	144.9
Other	141.5	149.5	17.5
Adjustments and eliminations	(66.5)	(37.1)	(26.8)
	1,509.8	1,243.2	597.6
<i>Investment in non-consolidated subsidiaries and associated companies</i>			
United States	43.7	38.1	31.1
Other	253.3	3.0	2.2
Total investment	297.0	41.1	33.3
Corporate assets	77.7	59.9	129.2
Total assets as at December 31	\$1,884.5	\$1,344.2	\$ 760.1

*Sales to customers include sales to Bell Canada, its telephone subsidiary and associated companies.

**Includes equity in net earnings of associated companies.

Transfers between business segments and geographic areas are made at prices based on total cost of the product to the supplying segment.

The point of origin of sales and the location of the assets determine the geographic areas.

Of the total sales to customers, including research and development, Bell Canada, its telephone subsidiary and associated companies, accounted for \$695,890,000 in 1979, \$621,941,000 in 1978 and \$612,608,000 in 1977. Total sales also includes rental and service revenue of \$158,418,000 in 1979, \$70,851,000 in 1978 and nil in 1977.

Operating earnings represent total sales less operating expenses. Research and development costs cannot be allocated on a geographic basis. In computing operating earnings, none of the following items has been added or deducted: investment and other income (net), interest charges, unrealized foreign currency gains (losses), general corporate expenses, income taxes and extraordinary items.

Identifiable assets are those assets of the corporation that are identified with the operations in each business segment or geographic area. Corporate assets are principally cash, investments and corporate plant and equipment.

Auditors' report

The shareholders
Northern Telecom Limited

We have examined the consolidated balance sheets of Northern Telecom Limited as at December 31, 1979 and 1978 and the consolidated statements of earnings, retained earnings, and changes in financial position for the years then ended. Our examinations were made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these consolidated financial statements present fairly the financial position of the corporation as at December 31, 1979 and 1978 and the results of its operations and the changes in its financial position for the years then ended in accordance with Canadian generally accepted accounting principles applied on a consistent basis.

Truick Ross Co.

Chartered Accountants

Montreal, Quebec
February 8, 1980

In September, Geneva, Switzerland hosted Telecom '79, the largest telecommunications exposition ever. Here Peter Pascali (left) of Northern Telecom International Limited chats with Greek PTT officials at Northern Telecom's booth.



Corporate offices

Northern Telecom Limited

1600 Dorchester Blvd. West
Montreal, Quebec H3H 1R1

Northern Telecom Limited

Corporate Executive Offices
33 City Centre Drive
Mississauga, Ontario L5B 2N5

Bell-Northern Research Ltd.

3500 Carling Ave.
Ottawa, Ontario K1Y 4H7

BNR Inc.

3174 Porter Drive
Palo Alto, California 94304

B-N Software Research Inc.

522 University Ave.
Toronto, Ontario M5G 1W7

NETAS-Northern Electric

Telekomünikasyon A.S.

Alemdağ, Caddesi
Ümraniye Üsküdar, Istanbul, Turkey

Northern Telecom A.G.

Glärnischstrasse 30
8002 Zürich, Switzerland

Northern Telecom (Asia) Limited

Malayan Credit House
96 Somerset Road, Singapore 9

Northern Telecom (CALA)

Corporation

8375 N.W. 53rd Street
Miami, Florida 33166

Northern Telecom Canada Limited

304 The East Mall
Islington, Ontario M9B 6E4

Northern Telecom, Inc.

International Plaza
Nashville, Tennessee 37217

Northern Telecom International Limited

33 City Centre Drive
Mississauga, Ontario L5B 2N5

Northern Telecom (Middle East) Limited

7 Cleveland Row
St. James S.W., London 1A1DB
England

Northern Telecom Systems Corporation

6110 Blue Circle Drive
Minneapolis, Minnesota 55435

Manufacturing locations

Canada

Amherst, N.S.
Aylmer, Que.
Belleville, Ont.
Brampton, Ont.
Calgary, Alta.
Charlottetown, P.E.I.
Kanata, Ont.
Kingston, Ont.
Lachine, Que.
LaSalle, Que.
London, Ont.
Montreal, Que.
Montreal North, Que.
North York, Ont.
Ottawa, Ont.
Regina, Sask.
Saint John, N.B.
St. John's, Nfld.
St. Laurent, Que.
Winnipeg, Man.

United States

Ann Arbor, Mich.
Atlanta, Ga.
Creedmoor, N.C.
Concord, N.H.
Goldsboro, N.C.
Kevil, Ky.
Leesburg, Fla.
Minnetonka, Minn.
Montevideo, Minn.
Moorestown, N.J.
Morrisville, N.C.
Morton Grove, Ill.
*Mt. Laurel, N.J.
Nashville, Tenn.
*Raleigh, N.C.
*Rancho Bernardo, Cal.
Richardson, Tex.
Sanford, N.C.
Santa Clara, Cal.
St. Paul, Minn.
Tampa, Fla.
Texarkana, Tex.
Warwick, R.I.
West Palm Beach, Fla.

Brazil

Rio de Janeiro

England

Hemel Hempstead

Republic of Ireland

Ballincollig
Galway

Malaysia

Penang

Turkey

Istanbul

*plants under construction

Principal products

Business communications

Data packet switching
Key telephone systems
Electronic and digital PABX systems
(combined voice and data)
Private and carrier network
switching systems

Cable

Telephone wires
Composite coaxial cables
Switchboard cables
Paper-pulp and paper-ribbon
insulated telephone cables
Polyolefin insulated telephone cables
Universal frame wires

Central office switching

Step-by-step switching systems
Crossbar switching systems
Electronic switching systems
Digital switching systems
Traffic Operator Position Systems
Centralized Automated Loop
Reporting System
Peripheral Systems

Electronic office equipment

On-line terminal systems
Data entry terminal systems
Distributed data processing systems
Remote batch terminal systems

Outside plant

Customer premises distribution systems
Terminals and closures
Splicing connectors
Miniature protector connectors
Loading devices
Protection devices
Auxiliary tools and devices

Power equipment

Power plants
Ringing and tone equipment

Subscriber apparatus

Rotary dial, push-button and
key telephones
Style, electronic and featured telephones
Coin telephones
Handsfree units
Repertory dialers
Modular hardware
Headsets
Data and display terminals

Test equipment

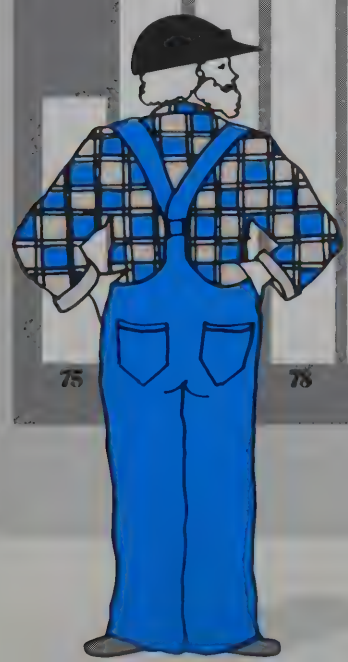
Transmission test equipment
Signaling and supervision test equipment
Service observation test equipment
Service analysis equipment
PCM carrier test equipment
Loop test equipment
Trunk test equipment
Data communications diagnostic
test equipment
Data communications patching and
switching equipment

Transmission

Analog and digital carrier systems
Analog and digital multiplex systems
Analog and digital microwave
radio systems
Voice frequency equipment and systems
Digital line transmission systems



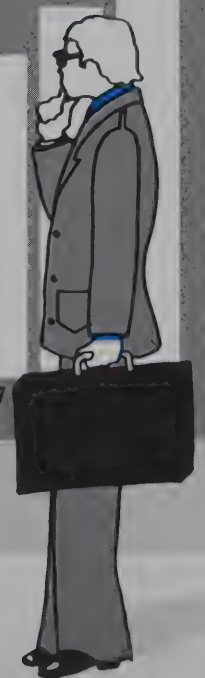
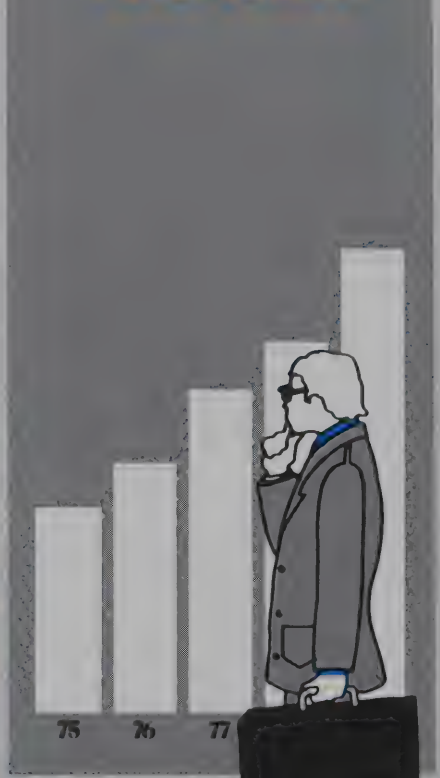
How many work here



What we sold



What the company earned



What we were paid



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Special section

This year's **Annual report to employees** contains a special section on how Northern Telecom is organized. The section includes eight pages of charts, pictures and explanations. It shows how subsidiaries are related to the parent corporation and illustrates the internal management structure of each subsidiary. Since the majority of employees work in manufacturing, the charts are keyed to manufacturing operations. **The big picture: who's what and where** is positioned at the center of this book for easy reference. You may want to keep it for future use. It begins on page 13.

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Corporate Relations Dept.
P.O. Box 458, Station A
Mississauga, Ontario
Canada L5A 3A2.

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Canada L5A 3A2

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Corporate Relations Department
Northern Telecom Limited
Mississauga, Ontario

No acknowledgement necessary

Northern Telecom Limited
1600 Dorchester Blvd. West
Montreal, Canada H3H 1R1

Research and development: what's in it for you



A. Jean de Grandpré
Chairman of the Board
Northern Telecom Limited

Research and development is one of Northern Telecom's major corporate activities. One out of eight Northern Telecom employees is involved in R&D. In 1979 our investment in R&D amounted to \$132.6 million, or about \$3,800 for every Northern Telecom employee. This investment pays off in direct and long-range benefits for all of us.

As an immediate benefit, R&D produces jobs—not merely for scientists, engineers, and technicians who work in labs, but for everyone involved in the design, manufacture, marketing, sales, and service of new products. It is estimated that one hour of research in the laboratory produces 50 hours of employment in other sectors. High-technology firms, such as Northern Telecom, that invest heavily in R&D create employment nine times faster than do other companies.

Research also creates opportunities for employees to use their minds and explore new frontiers of technology. This challenge exists for every worker who participates in the creation of a product, from its conception in the laboratory, to its birth in the factory, to its growth and coming of age in the marketplace.

By also improving products after they have entered the marketplace, R&D maintains the corporation's competi-

tive edge and protects the jobs it has created. Northern Telecom's leadership in technology helps ensure that jobs will not be lost to another firm or another country. In the long-run, R&D is the best form of job security.

But R&D also produces broader, economic benefits. It makes a country more productive, and its economy healthier. North America's strength lies predominantly in its human resources, and R&D creates opportunities for those individuals it has educated to work productively. Innovation thus reverses the "brain drain" and exploits for each country's benefit its most valuable resource—the human mind. It ensures that jobs will go to our own children and university graduates, not to foreign competitors.

R&D has still broader economic reverberations: it promotes the wealth of a nation. By increasing the number of jobs, it increases the number of individuals who pay taxes, and enables all, not just the few, to share the responsibility of providing for national health, welfare, education, and defense. Furthermore, the increased profits and sales that R&D provides mean that corporations collectively bear more of a country's tax burden. In 1979 Northern Telecom paid about

\$114 million in federal, provincial, state, and local taxes. This is more than its \$113.5 million net earnings for the year.

R&D also bolsters a nation's economy by promoting a more positive ratio of exports to imports. For a country to reduce its trade deficit, it must produce new, different, better, or bolder products—as the Swiss once did when they crafted the world's best watches, the Brazilians when they farmed the richest blends of coffee, and the Japanese when they entered the international television set and stereo markets. Through intensive R&D programs Northern Telecom has

designed leading-edge products, like the SL-1 business communications system and Digital World products, that have increased exports and strengthened the North American economy through impressive worldwide sales.

Finally, we might look at the wider social benefits of research and development. The Intelligent Universe that Northern Telecom is helping to create through its R&D programs has the potential for widespread social change. This potential is evident in the word "telecommunications." Broken



Every eighth Northern Telecom employee works in telecommunications research or on the design and development of new products and manufacturing processes.

Last year's success is this year's challenge

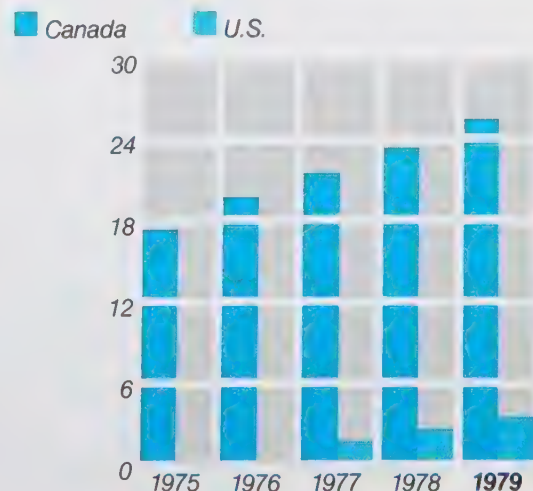
down into its parts, it means "long-distance," from the Greek **tele-**, and "sharing," from the Latin word **com-municare**. The potential for long-distant sharing may be realized in the future as telecommunications systems are used to link up, let us say, an inexperienced doctor in a remote region with a specialist in a renowned clinic or to join a professor with his students who are situated throughout the world. These information "highways" will crisscross the globe and take us anywhere that expertise is needed, without further depleting the world's stores of oil, gasoline, and other non-renewable resources.

The myriad economic and social benefits derived from R&D make research and development a public, not a private issue. Private companies alone cannot bear the entire burden of creating jobs, improving the economy, and shaping a future society. In the past decade Northern Telecom has invested almost \$575 million in R&D. In 1978 we spent \$97.8 million, and in 1979 \$132.6 million, an increase of 35.6 percent. Forecasts indicate that by the mid-1980s, to meet increasing competition, the corporation will have to devote at least \$250 million annually to R&D. The governments of Canada and the U.S. to date have offered only meager support for such intensive research programs.

In contrast, other governments have given massive support to their domestic telecommunications and computer industries. Japan has invested \$1 billion in semiconductor development, and has a \$250 million program to create advanced computer software. The West German government has launched a two-year \$300 million program for integrated circuit development, and the governments of France, the U.K., the U.S.S.R., and China have budgeted similar large expenditures for research.

The governments of Canada and the U.S., we hope, will become more aware of the crucial importance of R&D in shaping a healthier, more prosperous, and forward-looking society. R&D is a matter of the public good. It is also a matter of our individual good. ■

Number of employees in research
and development subsidiaries
(hundreds)



1979 was one of the most successful years in the history of our corporation. As you read through the pages of this report you will see that we made significant progress during the year in virtually every segment of our business. Every company in the Northern Telecom family, for instance, sold more products and services than the year before. We also increased our manufacturing strength in Canada and the United States. We broadened our commitment to research and development. And we strengthened our organization in terms of its structure and its people.

Our success was to a large extent due to the high caliber and strong commitment of our employees—the 35,100 individual managers and professionals, engineers and technicians, production workers and inspectors, clerks and secretaries, salesmen and installers, and other men and women who work in our plants, offices and laboratories.

The result of our collective effort was that in 1979 we increased our sales for the seventh successive year and, at the same time, positioned ourselves for continued success in the years ahead. The combined revenues of all Northern Telecom companies in 1979 were \$1.901 billion. This is 26.3 percent more than the \$1.505 billion we achieved in sales the year before.

Our sales in 1979 increased in every one of the major geographic areas in which we compete. About 39.7 percent of our revenues were in the U.S.

and 10.6 percent were in regions outside North America. In Canada, sales increased to \$944.8 million from \$925.7 million the year before. In the U.S., revenues rose from \$446.9 million in 1978 to \$754.7 million in 1979. And outside North America, our revenues were \$201.5 million compared to \$50.5 million in 1978.

One of the most gratifying aspects of our success is that it included most of the product categories in the two major segments of our business—telecommunications equipment and electronic office systems. Our customers bought \$1.505 billion worth of telecommunications equipment from us during 1979. They also paid us \$349.8 million for the electronic office systems they leased or purchased from Northern Telecom Systems Corporation (NTSC).

To keep up with our growth in these markets, in 1979 we announced new manufacturing plants or major expansions of existing facilities in six U.S. cities and three in Canada. The money invested in these and other facilities and in the new production equipment we bought during the year was distributed about equally between Canada and the United States.

In addition to providing us with additional resources to satisfy customer demand for our products, capital expenditure helps make our plants more efficient and increases our productivity—a critical factor in an industry as highly competitive as ours. An example of the results we



Walter F. Light
President and Chief Executive Officer
Northern Telecom Limited

achieved in this regard is the success of Northern Telecom Canada (NTC) in exceeding its 1979 objectives for productivity improvement and cost-reduction. NTC reduced costs by 10.5 percent during the year and helped us maintain our share of the Canadian telecommunications market and compete in foreign markets around the world.

In 1979 we announced two new plants for the manufacture of LSIs (Large Scale Integrated circuits). One of the plants, a 105,000-square-foot facility in Ottawa, Ontario is already in production. The other, a 50,000 square-foot building in Rancho Bernardo, California will be in operation early in 1981. The two plants will supply 60-to-70 percent of the custom-designed LSIs needed by other Northern Telecom plants in North America. They will help make us less dependent on outside suppliers and protect the LSI designs created by our research and development program.

Besides providing challenging work for about one out of eight Northern Telecom employees, our research and development program assures the continued success and well-being of the corporation in the future.

The 1980s will provide countless new opportunities for the telecommunications and information processing industries. To take advantage of the opportunities, as a corporation and as individuals, we have to adapt to new circumstances and changing conditions.

In 1979, for instance, we continued to build Northern Telecom Systems Corporation and to alter the structure and responsibilities of Northern Telecom, Inc. (NTI) to better equip these companies to compete in their respective markets. During the year, Leonard N. Mackenzie took charge of NTSC, and George W. Sullivan joined us as president and chief executive officer of NTI. Marcelo A. Gumucio was named Northern Telecom's executive vice-president, marketing. In addition to these senior management appointments there were literally hundreds of changes and other management appointments throughout the corporation.

In the 1980s the change and growth will continue. Change in the telecommunications industry is inevitable, because of ever-increasing competition in a constantly expanding market. I personally, take this as a challenge—to do even better in the next 10 years than we have done in the last 10. As you read through the articles of this report, I trust that you, too, will see the 1980s as one of the most exciting times to be working at Northern Telecom, a successful corporation and a world leader in virtually everything we set out to do. ■



Northern Telecom telephone sets are assembled in Nashville, Tennessee (above), as well as Amherst, Nova Scotia, London, Ontario and Regina, Saskatchewan. In Galway, Republic of Ireland they are assembled for our European customers.

The bottom line: how we did in 1979

Revenues and earnings

Our revenues increased by 26.3 percent to \$1.901 billion in 1979, from \$1.505 billion in 1978. Net earnings increased 20.2 percent to \$113.5 million, from \$94.4 million (excluding an extraordinary gain of \$6.3 million) in 1978. Employee compensation which includes salaries, wages and benefits went up 31.2 percent to \$759.9 million, from \$576.2 million in 1978. Dividends paid to shareholders were \$26.2 million compared with \$21.3 million in 1978.

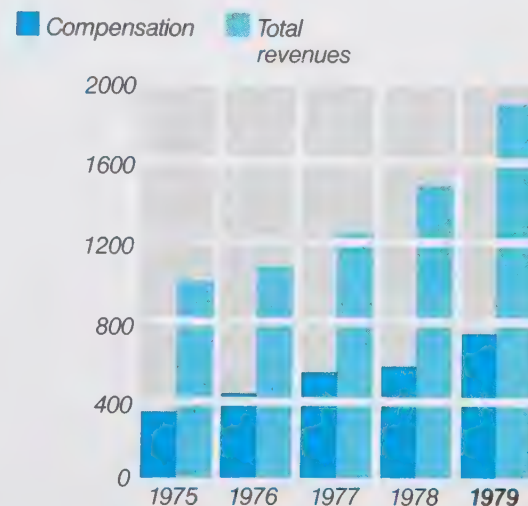
Markets

Our revenues in the United States and outside North America exceeded revenues in Canada for the first time.

We increased sales in Canada and maintained our position in the Canadian telecommunications market. However, as a percentage of total corporate revenues, sales in Canada decreased from 59.2 percent in 1978 to 49.7 percent in 1979. Sales of telecommunications equipment in

Canada were higher than in 1978 but were 58.5 percent of total manufacturing revenues, compared with 67.3 percent the year before. The drop in percentages was due to continuing weakness in the Canadian economy, lower than expected capital spending by Canadian telephone companies, and a rapid increase in sales in the U.S. market. Northern Telecom Canada's exports increased more than 50 percent from 1978 to 1979.

Compensation vs. total revenues (\$ millions)



Our revenues in the United States increased to \$754.7 million in 1979 from \$418.1 million in 1978. This represented 39.7 percent of total Northern Telecom revenues in 1979, up from 32.1 percent in 1978. Revenues from the sale of telecommunications

equipment in the U.S. were 35.5 percent of all telecommunications sales in 1979, compared with 27.5 percent the previous year. The increases were due to the strong performance of both major U.S. subsidiaries, Northern Telecom, Inc. (NTI) and Northern Telecom Systems Corporation (NTSC). Sales and leases of electronic office systems produced by NTSC were \$349.8 million or 18.4 percent of total corporate revenues.

Research and development

In 1979 about one of every eight Northern Telecom employees worked in research and development. The corporation's investment in R&D went up 35.6 percent in 1979 to \$132.6 million. It was \$97.8 million in 1978. Northern Telecom invested a total of \$574.4 million in the creation and development of new and enhanced products and in improved manufacturing methods in the 1970s.

A vote of confidence

In September 1979 Northern Telecom offered 3.5 million new shares to investors in Canada and the United States. Demand for the new shares was so great that the corporation increased its offering to four million shares. This is an indication of the confidence the financial community

Total manufacturing revenues by geographic area (percent)



has in our products and our prospects for the future. The share offering was sold out and Northern Telecom raised about \$198 million to help pay off some of its current debts.

How we did it

A more detailed discussion of our performance and the success of our products begins on page 21. ■

Who got what: where the money goes

We received \$1.9 billion in 1979 from sales and leases of equipment and for providing services to our customers.

As usual, most of these revenues went to Northern Telecom suppliers and employees.

We paid almost \$783 million for materials, goods and services. This was 41.1 cents of every dollar received. It was used to purchase raw materials such as silicon and copper, and components such as integrated circuits for the products we manufacture. We also bought production machinery, software programs, laboratory equipment and thousands of other items we needed to operate our business and sell our products.

Employee compensation accounted for the second largest portion, 40 percent, of the revenue dollar. Our salaries, wages and benefits totalled almost \$760 million. This is a record amount. In 1978, we as employees received 38.1 percent of the sales dollar, or a total of \$576 million. The increase from 1978 to 1979 was 32 percent.

Some of the increase in compensation was due to higher salaries and wages. Some was due to the hiring of new employees. But much of it was the result of increased benefits such as company pension funds and insurance plans, and contributions paid by the corporation on our behalf to government plans and agencies. In 1979

benefits were 14.2 percent of total compensation. Five years ago, in 1975, they were 12.2 percent.

Taxes took the third largest portion of our 1979 revenues. We set aside \$114 million, or six cents of each dollar of revenue, for federal, provincial, state and local taxes.

Another large portion of our 1979 revenues, \$92.4 million or 4.9 cents per dollar, was set aside for depreciation. This is the amount by which our machinery, buildings and equipment declined in value because of wear-and-tear and obsolescence.

The net interest we paid on our loans in 1979 was \$38.2 million, or two percent of our revenue dollar. We didn't

have this expense in 1978 because that year we received \$6.6 million more interest from investments than we paid for loans.

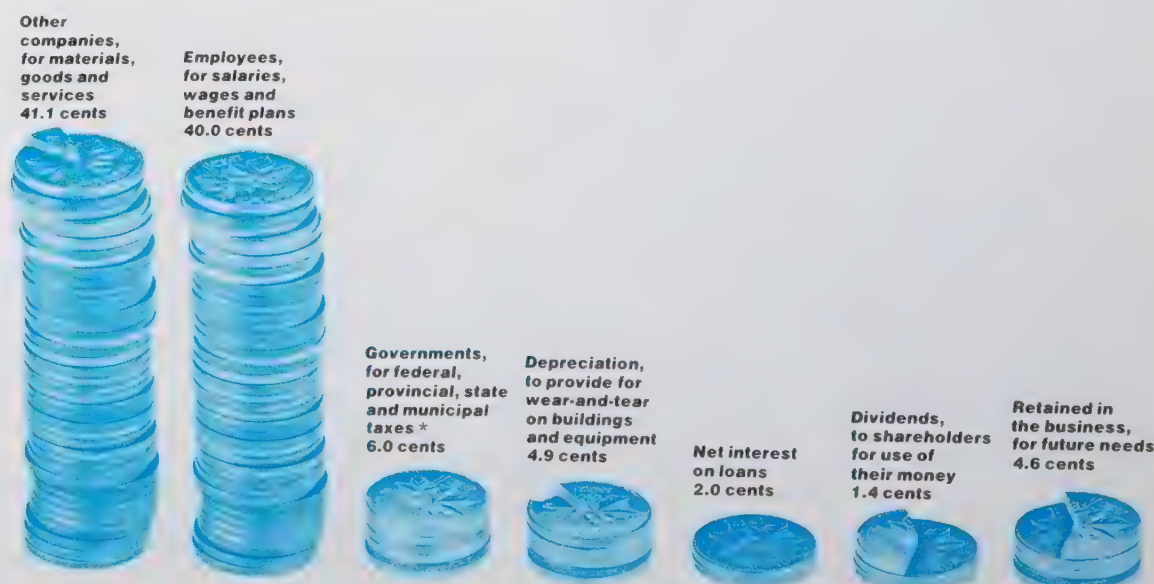
The money we had left after accounting for all 1979 expenses, six cents of each dollar received, was Northern Telecom's net earnings or after-tax profit. It was \$113.5 million. However, only a portion, \$26.2 million, went to our shareholders as a return on their investment. We put almost 77 percent of net earnings, \$87.3 million, back into the business to be invested in plants, production machinery and the equipment we lease to our customers. ■

How we spent almost two billion dollars

To other companies for materials, goods and services	\$ 782,897,000
To employees in salaries, wages and benefits	759,875,000
To governments for taxes*	113,693,000
Depreciation, to provide for wear-and-tear on buildings and machinery	92,370,000
Net interest on loans	38,215,000
To shareholders as dividends, for use of their money	26,155,000
Retained in the business for future needs	87,317,000
	\$1,900,522,000

*Excludes provincial sales tax

How each sales dollar was spent



The digital gamble: we bet our shirts and won

One of the most remarkable success stories in the history of our corporation is that of the Digital World. In the opinion of a New York securities analyst, "One thing clear about Northern is that they're emerging as **the** North American leader in telephone office switching. Their decision to go digital represented a real insight." Our achievement in successfully bringing the Digital World to market is an effort of which every Northern Telecom employee can be proud.

The Digital World was made public in 1976. In May of that year Northern Telecom unveiled its plans for a complete family of telecommunications switching and transmission systems based on digital technology. The corporation publicly committed itself to firm introduction dates for each of the new digital products. No other telecommunications manufacturer had made such a strong public commitment to digital technology.

The story of the Digital World began much earlier, in the 1960s, when Northern Telecom's planners looked into the future and saw the gradual coming together of the technologies of telecommunications and computers. They surmised that this would result in the formation of what has since been named the Intelligent Universe—an international network of people-directed electronic communications systems that would usher in a new human era.

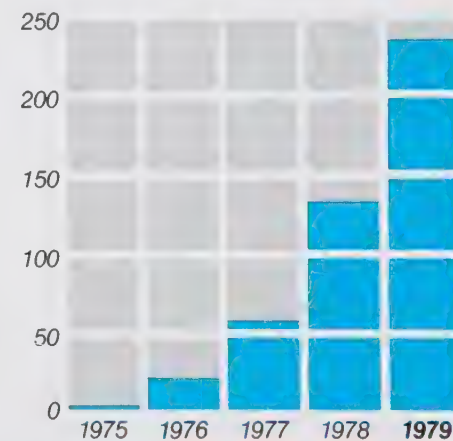
Northern Telecom began to invest heavily in the development of new products. "Northern Telecom's surge to the forefront of telecommunications is due to the strong emphasis placed on research and development," said a recent **Financial Times of Canada** article. The goal was to create products that would both satisfy current market demands and pave the way for the integrated information systems that would link homes, offices and other places of work in the future. Because it could not depend on government support, the corporation had to market its products internationally to generate sufficient R&D funds.

The first major product to result from the R&D investment was Northern Telecom's SP-1 electronic central office switching system introduced in 1971. The SP-1 was designed with the most advanced electronic techniques available at the time. It quickly became the best-selling system of its kind in Canada and among the independent telephone companies in the United States. By the end of 1979—eight years after introduction—213 SP-1 systems, serving an estimated 2.9 million lines, had been shipped from Northern Telecom plants.

But while the SP-1 and other electronic systems Northern Telecom introduced in the early 1970s were technologically in step with industry

leaders, the introduction of the Digital World midway through the 1970s put Northern Telecom **ahead** of its international competitors. Northern Telecom had accelerated the evolution of telecommunications technology into a new generation, even though it was a relatively small manufacturer.

Sales of principal
Digital World products*
(\$ millions)



*includes SL-1, SL-10,
and DMS switching and
transmission systems

Today, almost all of Northern Telecom's competitors have entered the digital race. "The 'Digital Derby' has moved into the backstretch and those other horses better start moving up before Northern Telecom runs away with the race," says **Telephone Engineer and Management**. "As they

head for the far turn it's still Northern Telecom by a couple of lengths," concludes a recent article in the magazine, one of North America's major telecommunication trade publications.

Digital World products are now in demand around the world—from Western Europe to the Caribbean, from Saudi Arabia to Hong Kong. And, in Canada and the United States, Northern Telecom sells more lines of digital switching systems than any other manufacturer.

The SL-1 digital business communications system is a prime example. The first SL-1 was introduced to the market in December 1975. By 1977 several European manufacturers had bought licenses to produce the SL-1 for their markets. By the end of December 1979, 1,253 SL-1 systems around the world were serving almost 693,000 telecommunications lines and another 452 were on order.

Northern Telecom's DMS (Digital Multiplex System) switching and transmission systems, the largest group of products in the Digital World family, are enjoying even greater market success. Introduction of DMS systems was in some cases a year ahead of the schedule announced in 1976. At the end of 1979, 1,272 DMS systems were shipped or on order. This included 791 DMS-1 subscriber carrier systems, 365 DMS-10 local switching systems, and 116 systems in the DMS-100 family of large switching systems.

In 1979 Northern Telecom signed a three-year agreement with American Telephone and Telegraph (AT&T) to supply DMS-10s to telephone companies in the U.S. Bell System. It also received major supply contracts from independent telephone companies. Continental Telephone Corporation and Central Telephone and Utilities (CENTEL) each signed US\$50 million two-year DMS supply contracts. Mid-Continent Telephone signed a two-year DMS contract for US\$25 million. These are, respectively, the fourth, fifth, sixth and largest telephone companies in the U.S. Also in 1979, the government of South Korea announced that Northern Telecom was the successful bidder for a three-year contract covering up to \$90 million of digital transmission systems.

A technological cousin of the SL-1, the SL-10 digital packet switching system, is also enjoying acceptance in the international marketplace. In 1979 Northern Telecom signed a contract for the delivery of 26 SL-10 systems to the Deutsche Bundespost, West Germany's postal and telecommunications authority. In Belgium, the Société Générale de Banque bought three SL-10s in 1979 to establish a private data packet switching network between Ghent, Antwerp and Brussels.

Other products such as the DRS-8 digital radio system, LD-1 and LD-4 digital repeatered line transmission systems, the ML series of digital multiplexers and the DE series of digital channel banks, have also contributed to the Digital World's success.

In addition to earning for Northern Telecom its worldwide reputation for technological innovation, the Digital World provides the corporation with a solid base on which to build its future. Because digital telecommunications can handle all types of information—including sound, image, numerical data and text—with equal ease, it is a foundation of the Intelligent Universe.

As the Intelligent Universe evolves in the 1980s the Digital World story will continue: Northern Telecom will enhance existing Digital World products, develop new ones, and continue to apply its technological expertise to other product areas such as subscriber apparatus, data transmission test equipment, optoelectronic communications systems, and computer data terminal systems. Northern Telecom will continue to be a pioneer of the Age of Information, an era which holds much promise for substantially improving and enriching the world in which we live. ■

Production of the SL-1 digital business communications system at Belleville, Ontario. SL-1s are also produced at Santa Clara, California. By the end of 1979 more than 1,200 SL-1 systems served 693,000 telephone lines around the world.



Robert C. Scrivener: an architect of our future

Bob (Robert C.) Scrivener, described by the **Toronto Star** as "one of the most outspoken corporate executives in Canada," retired on December 31, 1979 as chairman of the board of Northern Telecom Limited. Three months earlier he retired as its chief executive officer. He had held these positions since joining the corporation in 1976 from Bell Canada where he held the same title.

"The development with which Robert Scrivener is the most readily identified today is the emergence of Northern Telecom as a powerful, independent multinational," said a recent issue of **Canadian Electronics Engineering**.

The **New York Times** said, in October 1979, "He will leave a company fixed so well that it is now a world leader in telephone technology and considered by analysts to be one of the best run companies in this competitive industry."

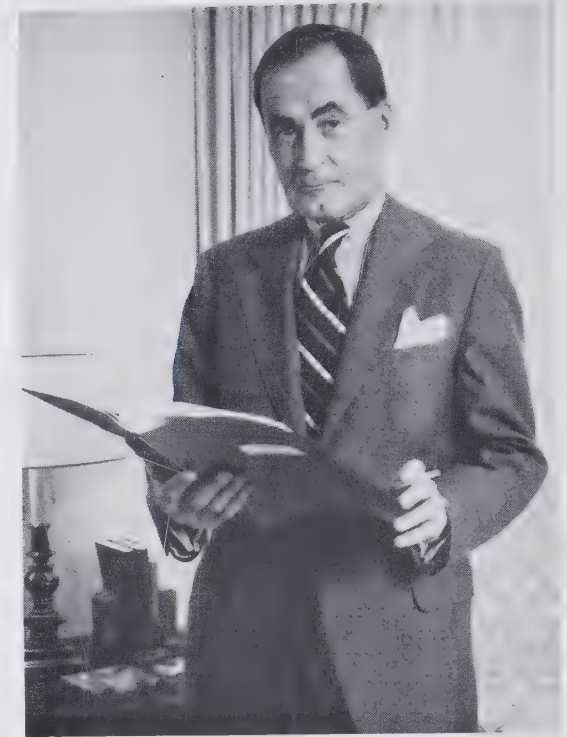
Bob Scrivener first became involved with Northern Telecom in 1962 when he was assigned to assess its financial health. The corporation was then known as Northern Electric and he was vice-president, finance at Bell Canada, its parent company. His assessment was that, because the corporation was encountering increasingly fierce competition for its traditional markets, "we either had to fix it or we might as well sell it."

The decision was made not to "fix" the company but to virtually rebuild it. The first step was to develop leading-edge technology. "Just over the horizon we could see the electronic switching systems which helped to establish us in the 1970s as North America's second-largest telecommunications manufacturer. Beyond that we could see digital technology. These are the systems we are now introducing for the eighties. Way down the line we could perceive the meeting of computer and telecommunications technologies," Scrivener said in an interview with **Kan'at'a** magazine. The second step was to create an aggressive market-oriented international management team.

Bob Scrivener's work at Northern Telecom and his impact on its management were characterized by three of his strongest personal attributes: optimism, tenacity, and a long-term view of the future. "You decide that there are places you want to go and that the only way to get there is to move people. To move them you must excite them," he told **Canadian Electronics Engineering**.

He will probably be remembered by the business community for his public viewpoints on industrial research and development. "Robert Carlton Scrivener is surely Canada's leading proponent of technological strategy and corporate goals. Both are closely linked with R&D," said the publisher of **ComputerData**.

The optimism, tenacity and long-range view of the future which are the hallmarks of Northern Telecom's principal architect, have become deeply ingrained in the structure and goals of the corporation he envisioned and helped to build. ■

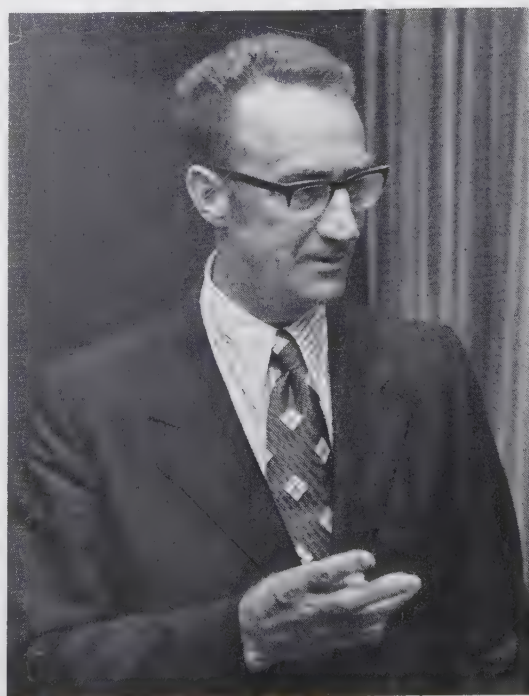


Walter F. Light: Northern Telecom's new boss



Walter F. Light, 56, became Northern Telecom's chief executive officer on October 1, 1979. He has served as the corporation's president since 1974. Before that he was executive vice-president, operations at Bell Canada, the largest telephone company in Canada, where he worked for 25 years.

His management style is pragmatic, down-to-earth and direct. He demands a lot of himself and of the people who work under his direction. "You must respect the human worth and dignity of the individual....though in no way must you lessen your demands on people for top performance," he says.



Walter Light plans to continue to lead the corporation in the same general direction as he mapped out with Robert C. Scrivener, his predecessor as chief executive officer. "Are there going to be any differences in Northern Telecom's goals and objectives? I think not. We've been through a period of acquisitions and have a pretty full plate at the moment. We won't be out looking for any large companies in the next year or two. We're going to continue to shoot for market share and for high improvements in efficiency, and we'll continue to look for a good return for the shareholder. We'll also keep pushing the Canadian government, in fact, all governments, to support Northern Telecom to the extent that we feel is



right, so that we can stay a winner," he commented recently in an interview with **Telesis**, Bell-Northern Research's science and technology magazine.

Described by the **Financial Times of Canada** as "a large (6'2"), amiable 56-year-old who toiled in the gold and nickel mines of Northern Ontario," Mr. Light was born and raised in the small mining town of Cobalt, Ontario. He joined the Royal Canadian Air Force in 1942. Following service overseas, he attended Queen's University where he graduated with an honors Bachelor of Science degree in 1949.

His current social and business interests and commitments extend beyond his position at Northern Telecom. He is a director of Bell Canada, Genstar Limited, Hudson's Bay Oil and Gas Company Limited, Inco Limited and the Royal Bank of Canada. He is a director of Canadian Executive Service Overseas and of the Montreal Symphony Orchestra, a governor of the Montreal Museum of Fine Arts and of The Associates of Carleton University, and a member of the Board of Trustees of Queen's University. He is a fellow of the Engineering Institute of Canada and the C.D. Howe Research Institute.

He is a recognized collector of antique Canadiana, is married, has two daughters, and lives in the Town of Mount Royal (a suburb of Montreal), Canada. ■

Whodunnwhat?

the annual report as a bestseller

To some, a corporation's annual report is nearly as intriguing as a good spy novel or detective story. To others, it is a jumble of complicated words and numbers. The difference is that some people understand how important the annual report is to everybody who depends on the corporation and know what to look for when reading it.

An annual report is a book with many plots, many characters and many endings. Scores of executives, managers and specialists contribute ideas, figures, charts, pictures and other information about the corporation's activities, plans and accomplishments. Each individual reader selects the story line which answers his particular questions and deals with his own interests.

Northern Telecom's annual report, published each year in March, is its most important public document. It is a thorough public accounting of how well the company is doing.

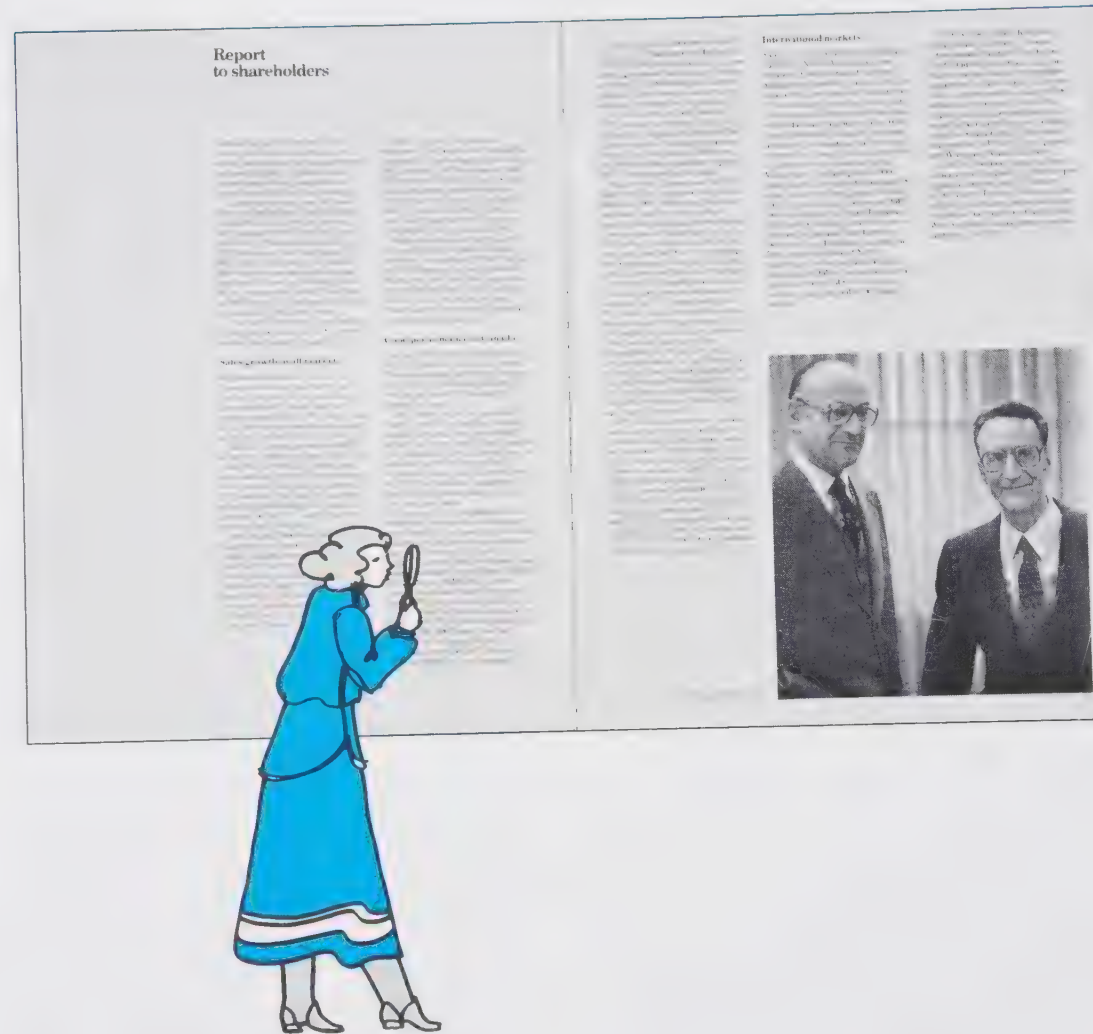
Thousands of readers

Shareholders—individuals and institutions who own the corporation because they have invested their money in it—want to know if they should leave their money invested in corporate shares. Bankers, investment analysts, stockbrokers and other members of the financial community want to know how well the corporation is using its money. Gov-

ernment officials want to know how much and in what fields the corporation conducts research and development, how many people it employs or where its facilities are located. Customers want to know how the corporation's products and services are viewed in the marketplace. Suppliers want to know about prospects for fu-

ture business. Employees, because they are the corporation and because their careers and financial security depend on the corporation, want to know all this and much more.

What, then, is the important information in an annual report and how can the average person understand it?



Six chapters

The Northern Telecom annual report is composed of six main sections and a few self-explanatory items such as lists of corporate facilities and products, names of senior management, and pictures.

The first main section, the **Financial highlights**, is a bird's-eye view of the corporation and its financial activity in the past year. This section in Northern Telecom's 1979 annual report, for instance, shows that the company sold almost \$1.901 billion of products and services during the year, earned \$113.5 million on these sales and employed 33,301 people at year-end.

The **Report to shareholders** from the president and the chairman of the corporation is a general summary of the corporation's activities in the past year and its general outlook for the future. In 1979 the **Report to shareholders** explained that sales were up 26.3 percent from the previous year, that 49.7 percent of sales were in Canada, 39.7 percent in the U.S. and 10.6 percent outside North America.

The theme section of the annual report, which this year is titled **Software: mind over machine in the Intelligent Universe**, distinguishes Northern Telecom's annual report from most others. Each year, in a non-financial essay-type article this section discusses some vital aspect of the corporation's operations.

The next two sections, the **Financial review** and the financial tables, are probably the most intimidating for novice annual report readers. But there is little in these lists and descriptions of numbers that cannot be understood with a little common sense.

Figuring out the plot

The **Financial review** is a detailed analysis of the figures discussed in the **Report to shareholders**. It also explains the numbers listed in the financial tables which follow it. The 1979 **Financial review** reveals, for example, that the companies which joined Northern Telecom in 1978 (Sycor and Data 100 which became Northern Telecom Systems Corporation, and Spectron) contributed \$385.7 million to the corporation's sales in 1979.

The financial tables which follow are just as easy to understand, especially if they are read in conjunction with the notes that follow them.

Northern Telecom includes seven major financial tables in its annual report. The first of these, called **Business segments and principal product lines**, is at the end of the **Financial review**. It is a breakdown of how much each group of products contributed to total corporate sales. For example: in 1979 the largest portion of telecommunications sales was the \$525 million received for subscriber apparatus.

The next set of tables is the **Consolidated statement of earnings**. As its title suggests, this section explains how much the corporation earned or, in other words, how much **profit** it made. (**Consolidated**, by the way, means the whole corporation including all major subsidiaries except NETAS.) 1979 profit was calculated by first subtracting from the \$1.901 billion of sales the \$1.3 billion it cost the corporation to make these sales.

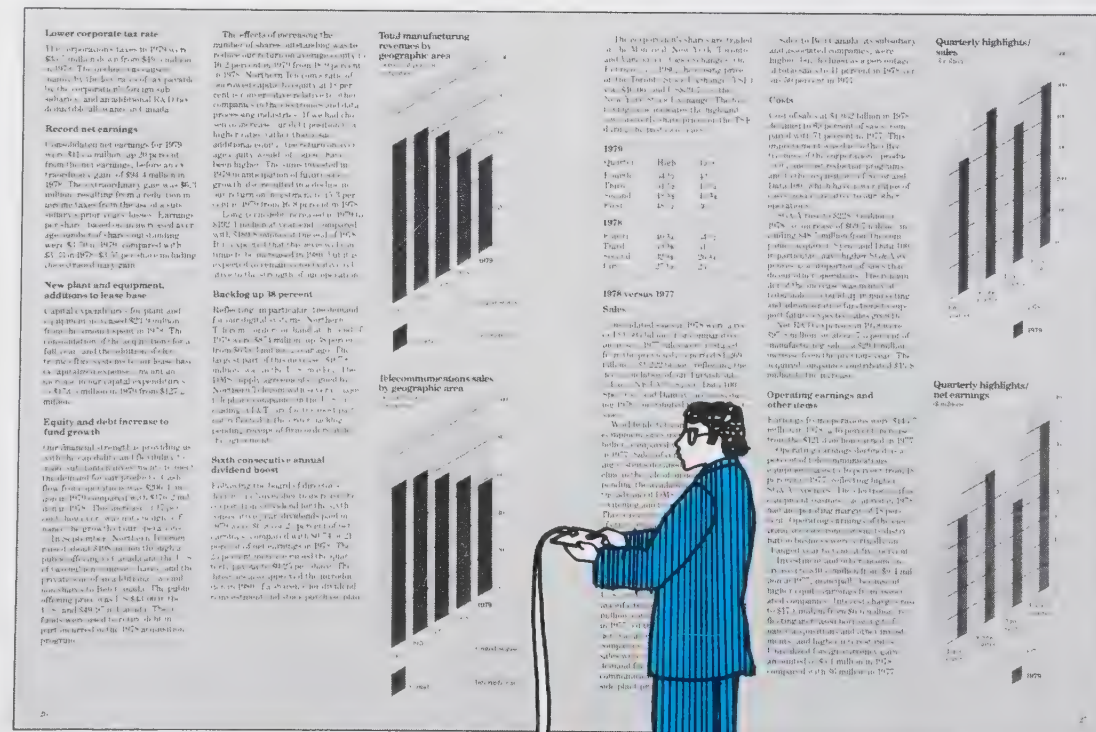
This is the sum of wages and benefits paid to employees, the cost of parts, raw materials and components, and other materials directly related to producing the products sold. The balance is called **gross profit** and in 1979 was \$596.4 million. Other expenses such as research and development, administrative costs and taxes are then deducted to arrive at net profit or **net earnings**—the \$113.5 million referred to in the **Financial highlights**.

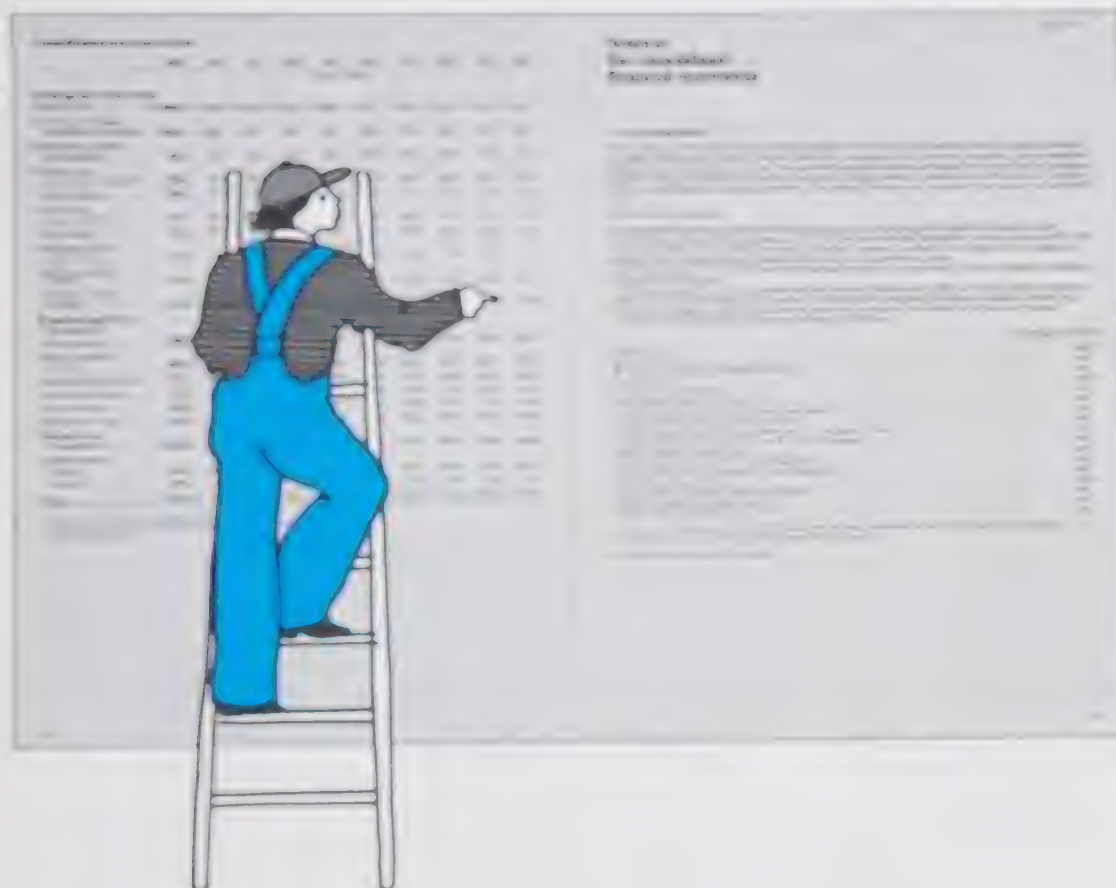
The next statement shows what happens to the profit. The **Consolidated statement of retained earnings** adds the current year's profit to money the corporation had at the beginning of the year and subtracts the amount paid out to shareholders (called dividends). After deducting expenses incurred in connection with issuing new stock during the year, the balance of the money retained by Northern Telecom at the end of 1979 was \$473.6 million. This money is invested mostly in manufacturing plants, laboratories and equipment.

The **Consolidated balance sheet** is a two-page statement which compares what the corporation owns, its **assets**, with what it owes to others, its **liabilities**. In 1979 Northern Telecom's largest single **asset**, \$492.5 million, was the money it invested in inventories—parts, raw materials, finished goods, and work in process on the shop floor. Total **assets** at the end of 1979 were \$1,884.5 million.

Liabilities, on the other hand, included the \$100.6 million the corporation owed on short-term loans, the \$266 million of bills it still had to pay, and the \$22.2 million in taxes it owed to various governments on the last day of the year. Total **liabilities** at the end of 1979 were \$966.9 million.

The difference between 1979 **assets** and **liabilities** was \$917.6 million. This is the corporation's net worth. Because this is what is owned by the corporation's shareholders, it is also known as **shareholders' equity**.





The Consolidated statement of changes in financial position is a comparison of how much money flowed through the corporation during the year compared to the year before. This statement is divided into two parts: **Sources of funds** and **Application of funds**. The first part details where money came from. In 1979, for instance, \$197.7 million came from the sale of new stock to shareholders. The total received in 1979 was \$952.5 million, compared to \$511 million received in 1978.

The second part, **Application of Funds**, details how the money was used. \$328.1 million was used in 1979 to pay off long-term loans. The total paid out was \$762.8 million, compared to \$480 million in 1978.

The difference between money received and money spent in 1979 was \$189.7 million. This is called an **increase in working capital**. It was added to the working capital on hand at the beginning of the year. The total, \$556.9 million, was working capital on the first day of 1980.

The Condensed statement of earnings, which follows, compares the year's sales and earnings with the sales and earnings of previous years. It also shows how earnings were divided among shareholders. There was an average of 30.7 million shares in the corporation in 1979, so the \$113.5 million that Northern Telecom earned during the year worked out to an average of \$3.70 a share.

The last statement, the **Consolidated ten-year review**, makes historical comparisons of such items as numbers of employees, sales, long-term debt and profits. Ten years ago, for instance, Northern Telecom had 24,986 employees. At the end of 1979 it had 33,301 employees, excluding the 1,807 employees at NETAS in Turkey. Employee benefits in 1970 totalled \$25.4 million and were 11 percent of employee compensation. In 1979 benefits were \$108.1 million and 14.2 percent of compensation.

The ending

Some people find that the last major section of the annual report, as the last chapter of a book, is the most interesting; certainly it is one of the most important. The **Notes to the consolidated financial statements** contains details about many of the facts and figures presented earlier. This year, for instance, the notes show that at the end of 1979 Northern Telecom's \$492.5 million inventory was made up of \$167.5 million of raw materials, \$164.7 million of work in process, and \$160.3 million of finished goods.



They also showed that \$421 million was tied up in land, manufacturing plants and equipment at year-end.

As with any good book, each reader of the annual report draws his own conclusions from what he or she reads. Northern Telecom's annual report contains enough information to answer virtually anybody's questions about what the corporation is doing, how well it is doing, and what it plans for the future. Certainly there is enough to convince an employee that he or she is working for a corporation with a bright future.

The Northern Telecom annual report is available free of charge. If you cannot get a copy at your place of work, contact your local public relations department or write to:

Corporate Relations Department
Northern Telecom Limited
P.O. Box 458, Station A
Mississauga, Ontario, Canada
L5A 3A2 ■

The big picture: who's what and where

The resources of a business enterprise consist mainly of people, money, and physical assets such as land, buildings and equipment. Each of these is carefully planned, organized and managed to achieve a company's objectives.

Northern Telecom employs more than 35,100 people in 56 manufacturing plants, in nine principal research and development laboratories and in scores of sales and administrative offices around the world. Its employees are the lifeblood of the corporation and its most critical resource.

The management of Northern Telecom's resources—human and other—is decentralized to make operations flexible, efficient and responsive to changing conditions. The corporation is divided into subsidiaries each of which is further divided into groups or divisions. Each unit, called a profit center, is responsible for either a specific geographic region or a group of products.

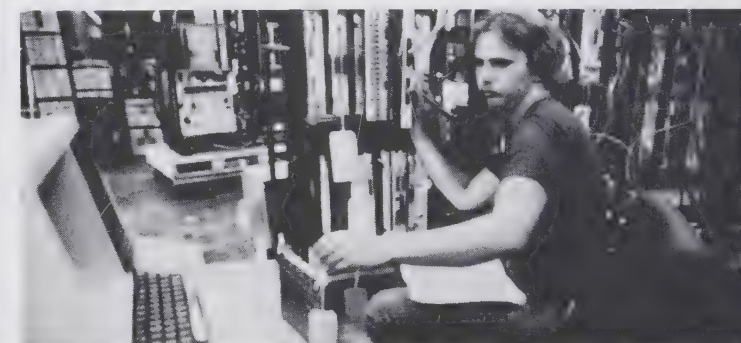
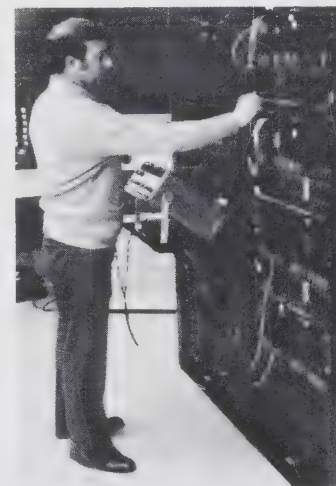
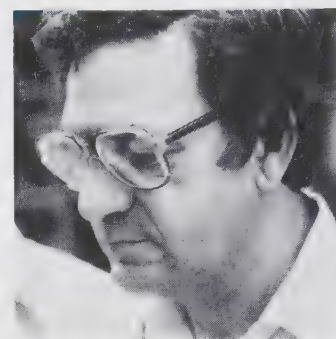
The following seven pages of charts show how the corporation is organized and how major profit centers are related to each other. The charts are also a snapshot, taken at the beginning of

1980, of the corporation's management. They do not include all functions vital to the corporation. For the sake of simplicity, the charts concentrate on those who direct manufacturing, and research and development activities, since this is where about 80 percent of Northern Telecom employees work. The other 20 percent work in such critical activities as finance and accounting, marketing and sales, personnel, advertising and engineering.

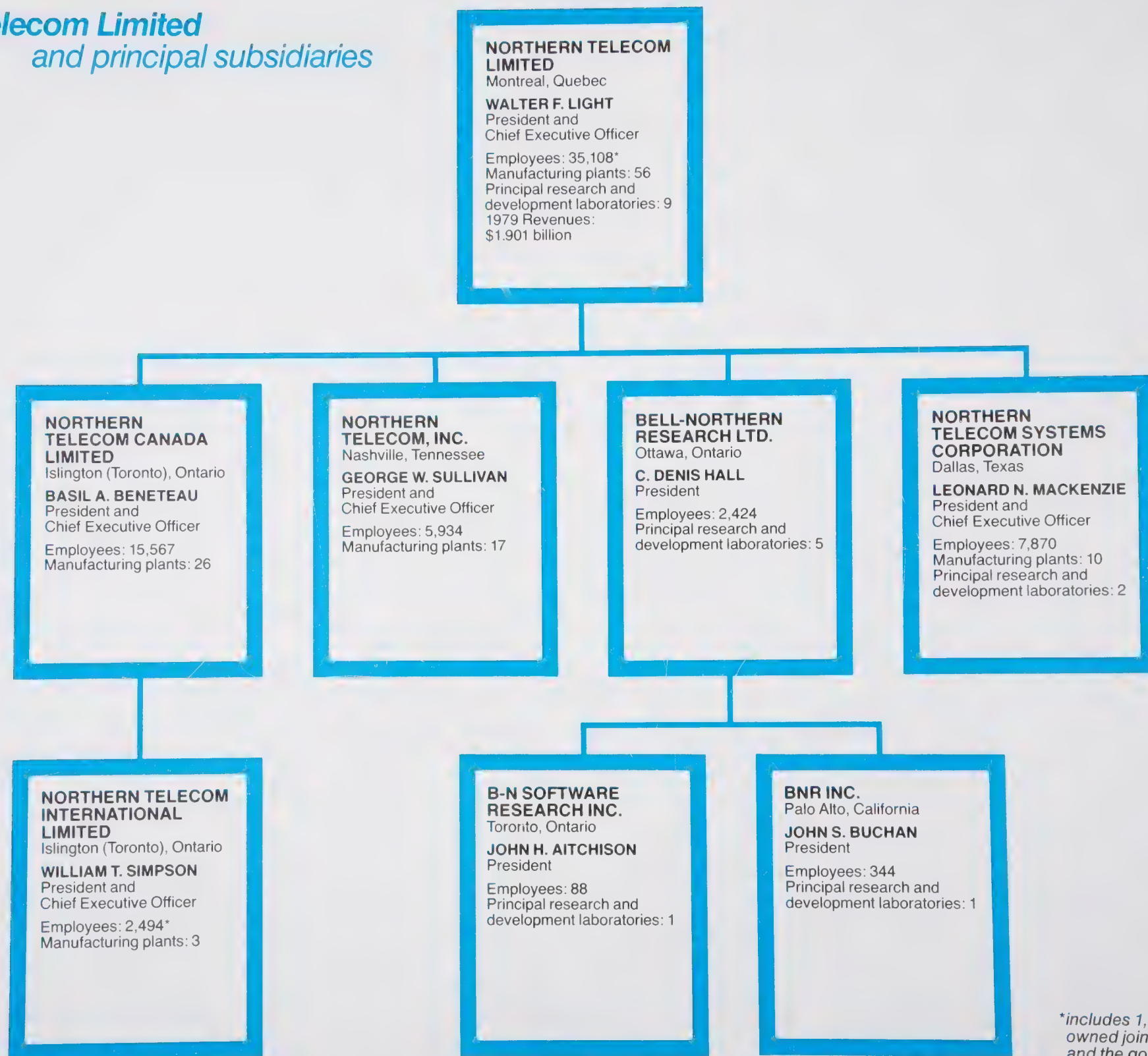
The first chart shows the administrative relationship between Northern Telecom Limited and its major subsidiaries. Actual day-to-day reporting relationships, shown on subsequent charts, are in some cases not the same as administrative relationships.

*By looking through the charts you should be able to figure out how your own work fits into the corporate structure. You may want to keep the charts or the whole **1979 Annual report to employees** for future reference. ■*

Northern Telecom's employees are its most valuable resource. They work in manufacturing plants, laboratories and offices around the globe.

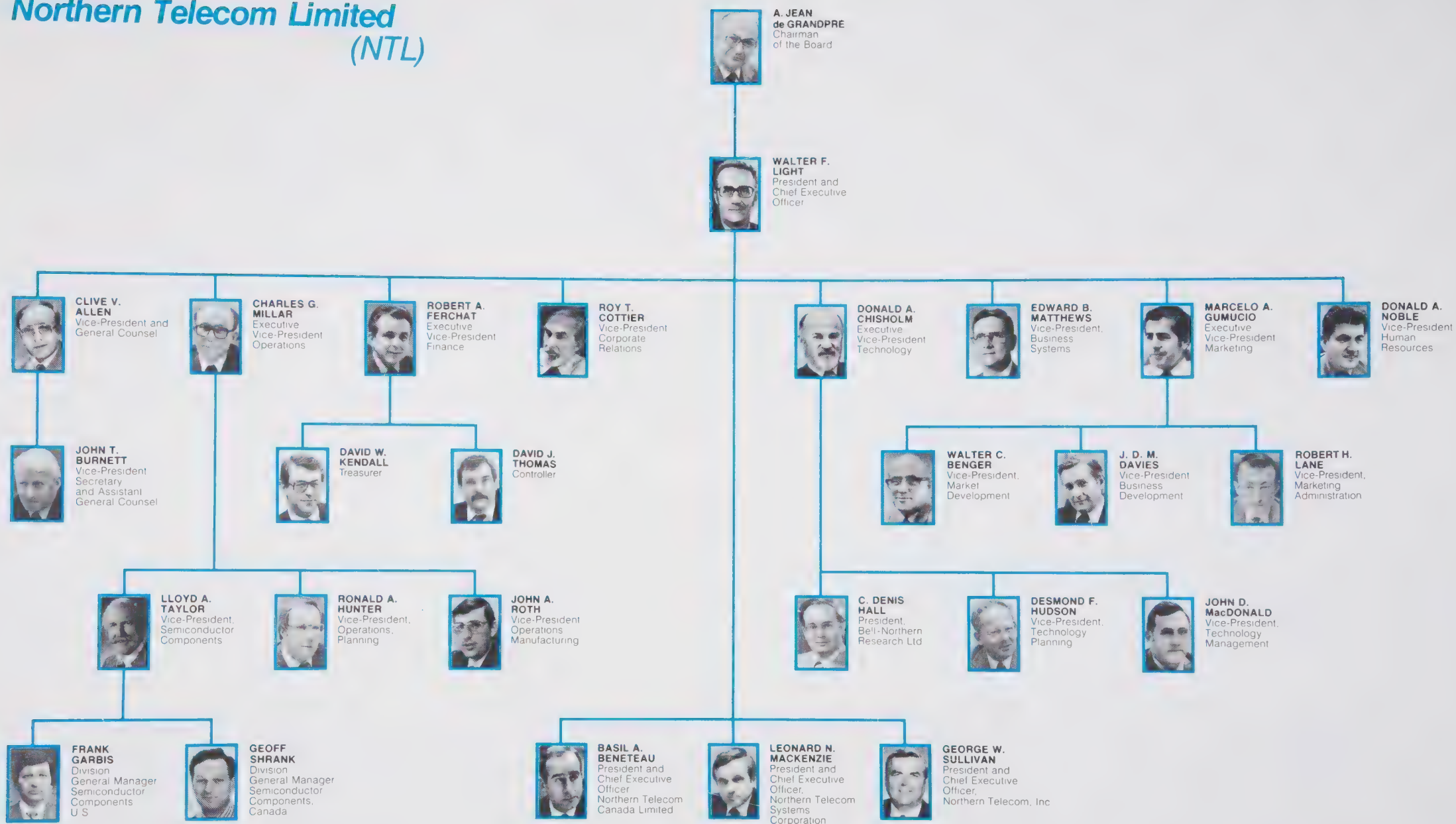


Northern Telecom Limited
and principal subsidiaries

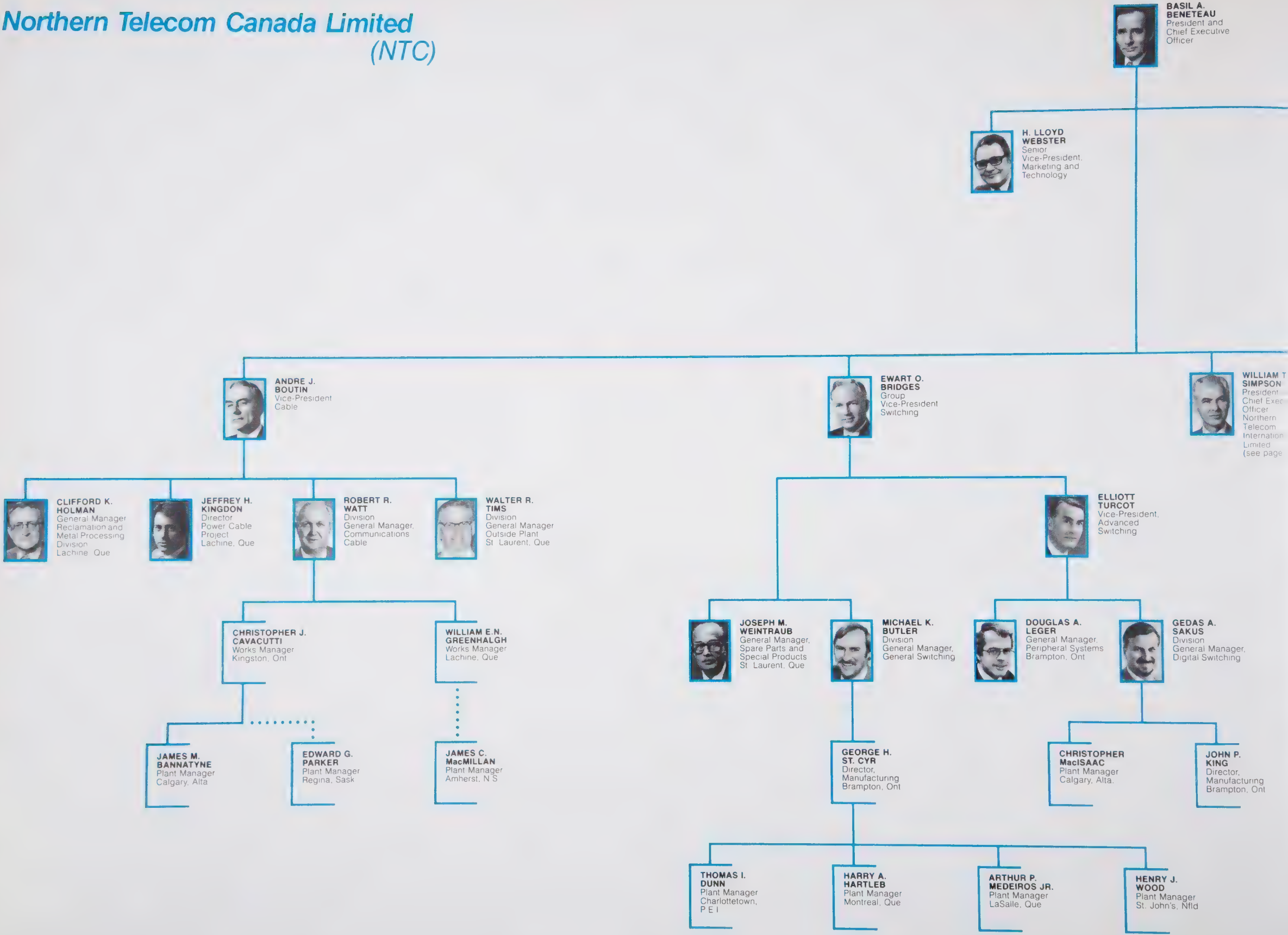


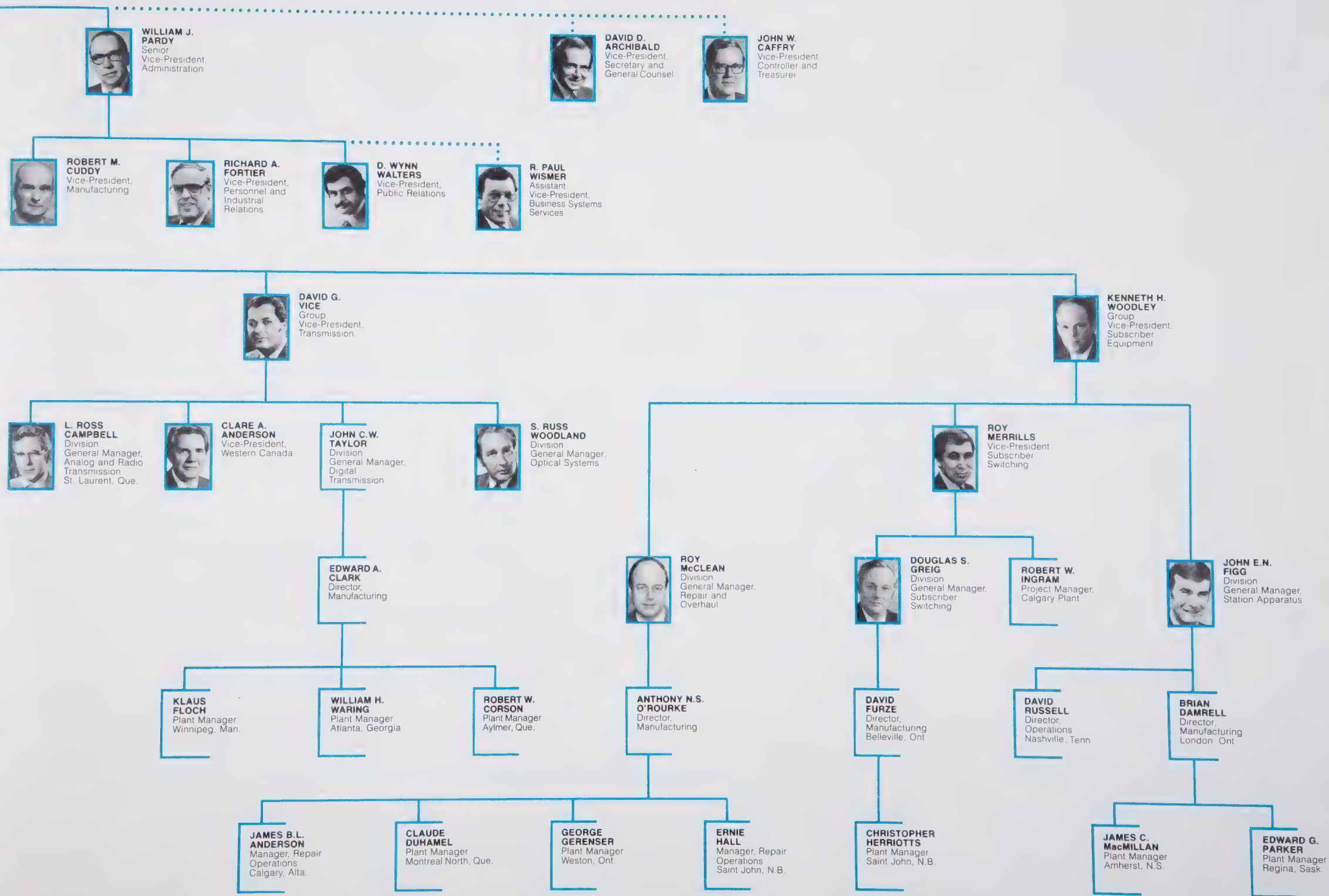
*includes 1,807 employees of NETAS, owned jointly by Northern Telecom and the government of Turkey

Northern Telecom Limited (NTL)

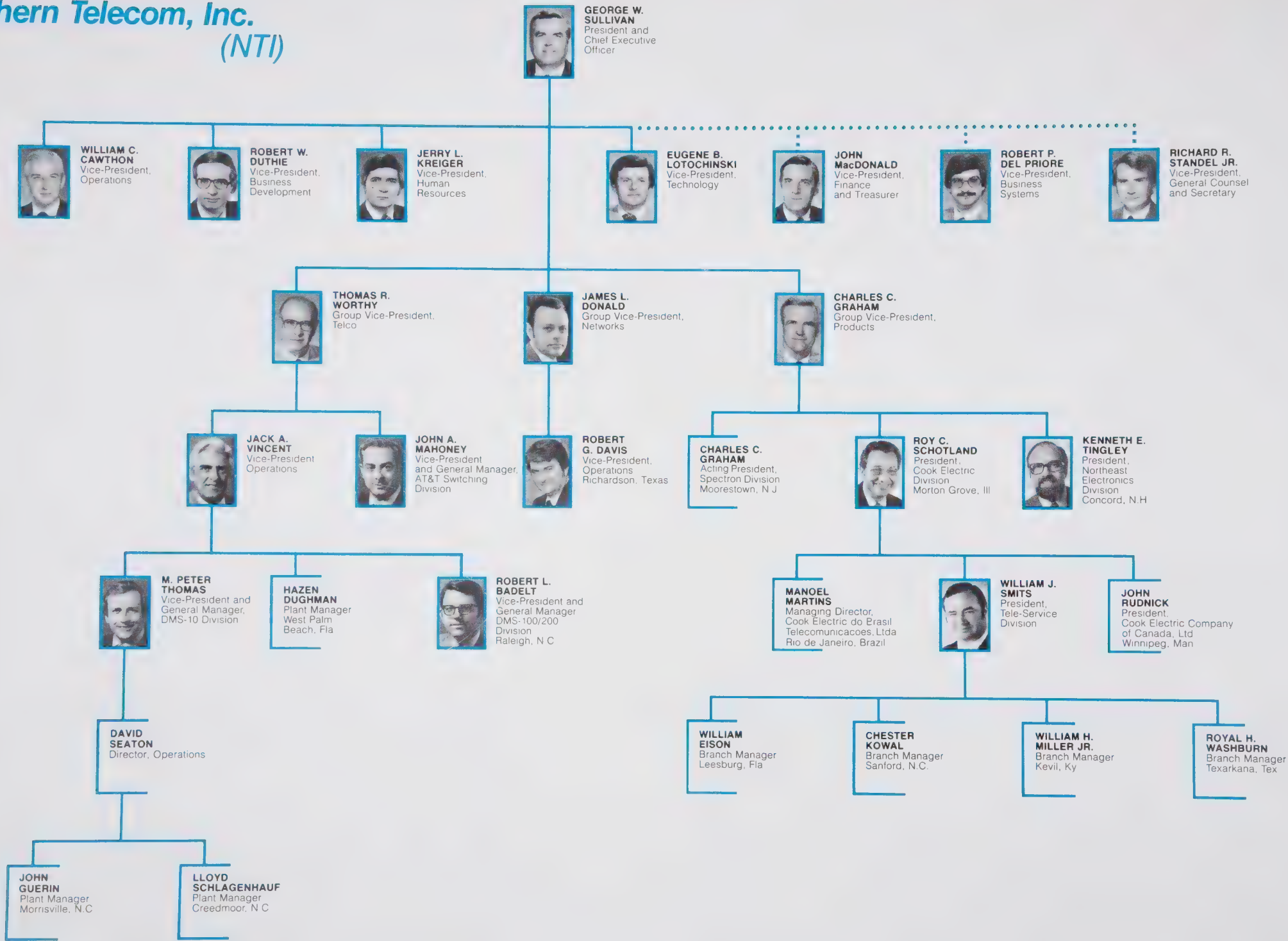


Northern Telecom Canada Limited
(NTC)





Northern Telecom, Inc.
(NTI)



Northern Telecom Systems Corporation (NTSC)



LEONARD N. MACKENZIE
President and
Chief Executive
Officer



PALLE KIARI
Senior
Vice-President,
Business
Development
and Planning



MELVIN E. STEVER
Group
Vice-President,
Customer Service



C. TRENT RILEY
Vice-President,
Human Resources



WILLIAM J. WAIBEL
Vice-President,
Distributor Sales



JAMES W. BROWN
Senior
Controller



RICHARD R. STANDEL JR.
Vice-President,
General Counsel
and Secretary



BO W. WISSER
Vice-President,
Business
Systems



EDWARD J. MATTIUZ
Group
Vice-President,
Business
Communications
Santa Clara, Cal



FRANK T. CONNORS
Group
Vice-President,
Computer
Systems



DOUGLAS C. CORNWALL
Vice-President,
European
Operations



GERALD G. JONES
Vice-President,
Manufacturing



ANTHONY FAZIO
Vice-President,
Marketing



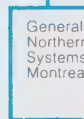
BARRY W. EAMES
Managing Director,
Data 100 Systems
Limited
Harpden, England



SATURNINO MONTJOJO
General Manager,
Data 100 S.A.
Madrid, Spain



PALO VALENTE
General Manager,
Data 100 S.P.A.
Milan, Italy



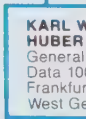
General Manager,
Northern Telecom
Systems Limited
Montreal, Canada



BERTRAND BEAUGONIN
General Manager,
Data 100 S.A.
Paris, France



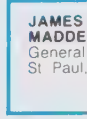
PAUL OTTOY
General Manager,
Data 100 B.V.
Amsterdam,
Netherlands



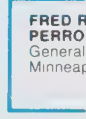
KARL W. HUBER
General Manager,
Data 100 GmbH
Frankfurt,
West Germany



WILLIAM BROWN
Plant Manager
Montevideo, Minn



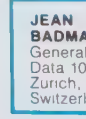
JAMES F. MADDEN
General Manager
St. Paul, Minn



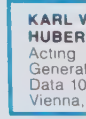
FRED R. PERRO
General Manager
Minneapolis, Minn



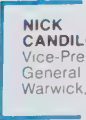
ROGER LIVETT
Manager,
Manufacturing
Hemel Hempstead,
England



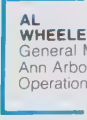
JEAN BADMANN
General Manager,
Data 100 A.G.
Zurich,
Switzerland



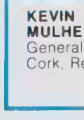
KARL W. HUBER
Acting
General Manager,
Data 100 GmbH
Vienna, Austria



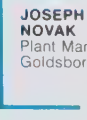
NICK CANDILOROS
Vice-President and
General Manager
Warwick, R.I.



AL WHEELER
General Manager,
Ann Arbor
Operations

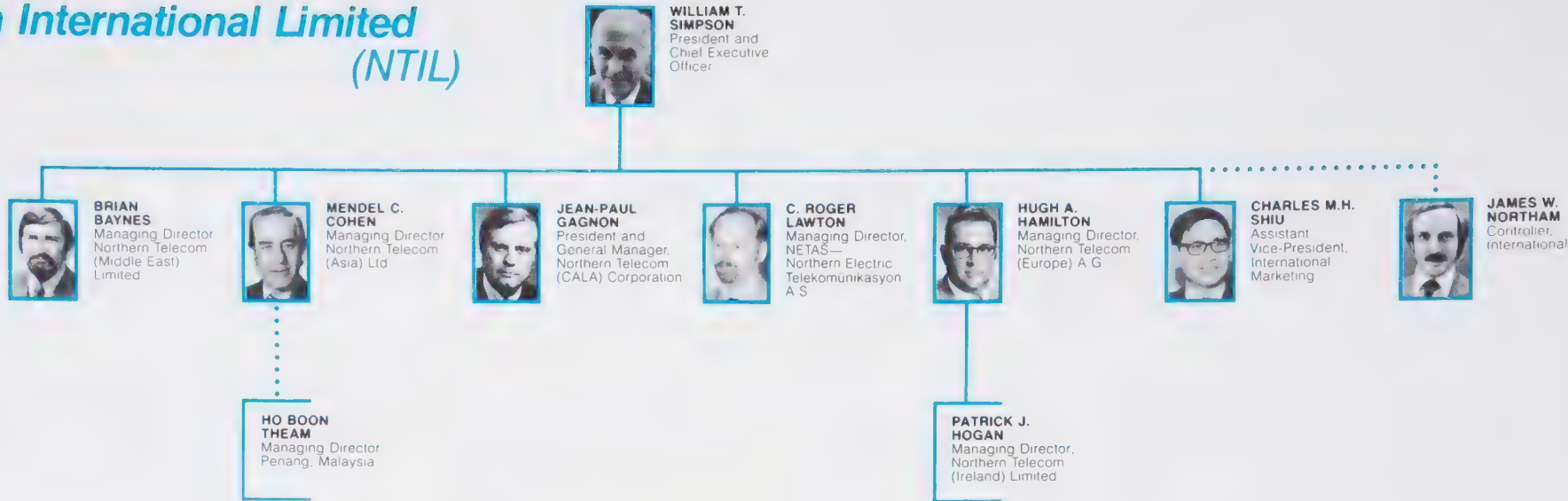


KEVIN MULHERN
General Manager
Cork, Republic of Ireland

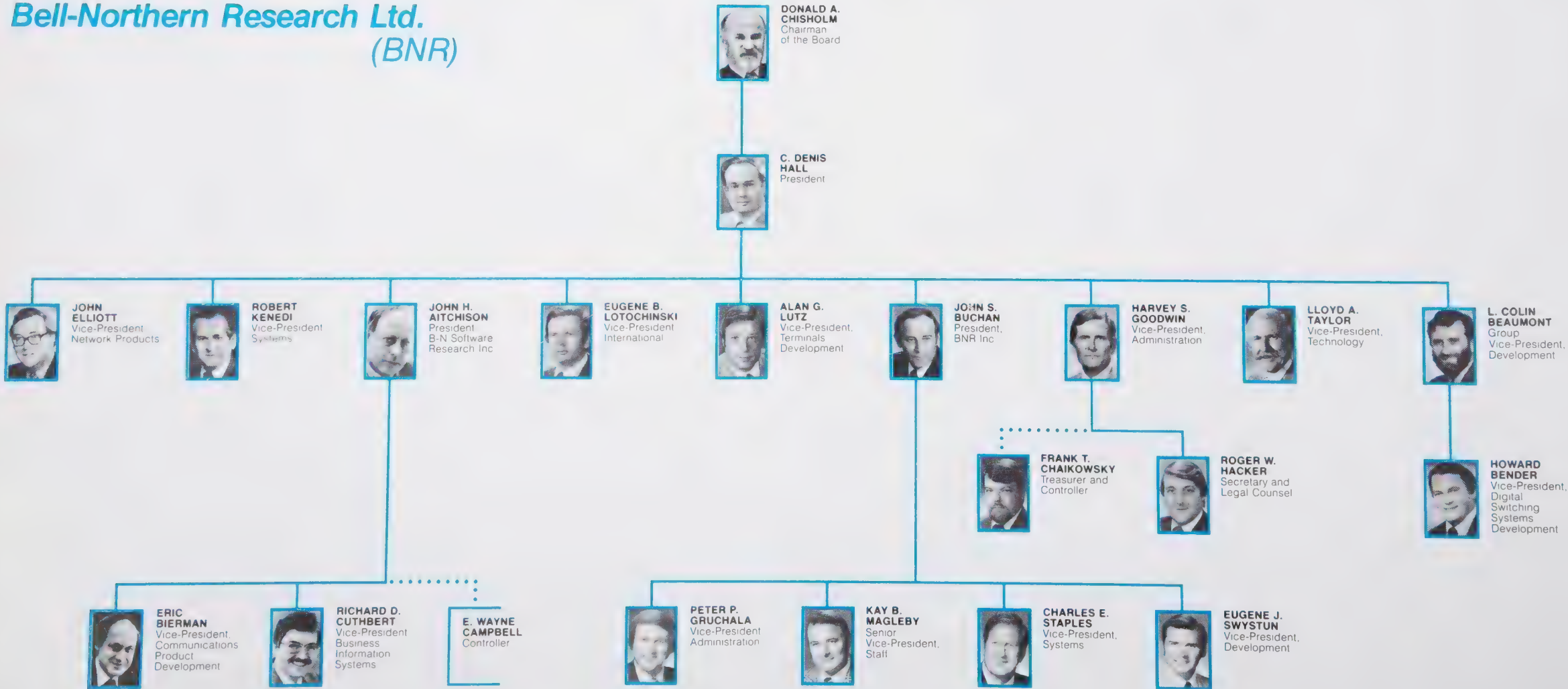


JOSEPH M. NOVAK
Plant Manager
Goldsboro, N.C.

Northern Telecom International Limited (NTIL)



Bell-Northern Research Ltd. (BNR)



Another successful year

Northern Telecom designs, manufactures and services telecommunications equipment and electronic offices systems. These products are sold or leased to customers in three geographic areas: Canada, the United States and countries outside North America. In 1979, total revenues from sales and leases around the world were \$1.901 billion. At the end of the year our backlog of orders was the highest it has ever been, \$874 million.

In Canada, telecommunications equipment is manufactured and marketed by Northern Telecom Canada Limited (NTC). This is Northern Telecom's largest subsidiary. It is headquartered in Toronto, Ontario, employs 15,567 people, and operates 26 manufacturing plants in nine Canadian provinces. Some \$227 million, or 20 percent, of the equipment and components sold by Northern Telecom Canada in 1979 was exported.

NTC also does about 40 percent of Northern Telecom's research and development (R&D) in Canada. The rest is done by Northern Telecom's major research and development subsidiary, Bell-Northern Research Ltd. (BNR), which employs 2,856 and is headquartered in Ottawa, Ontario. BNR also has facilities in Montreal, Quebec and Toronto, Ontario. Another facility will be constructed in Edmonton, Alberta.

BNR has two subsidiaries. BNR Inc., in Palo Alto, California, develops telecommunications equipment primarily for the U.S. market. B-N Software Research Ltd., is headquartered in Toronto, Ontario.

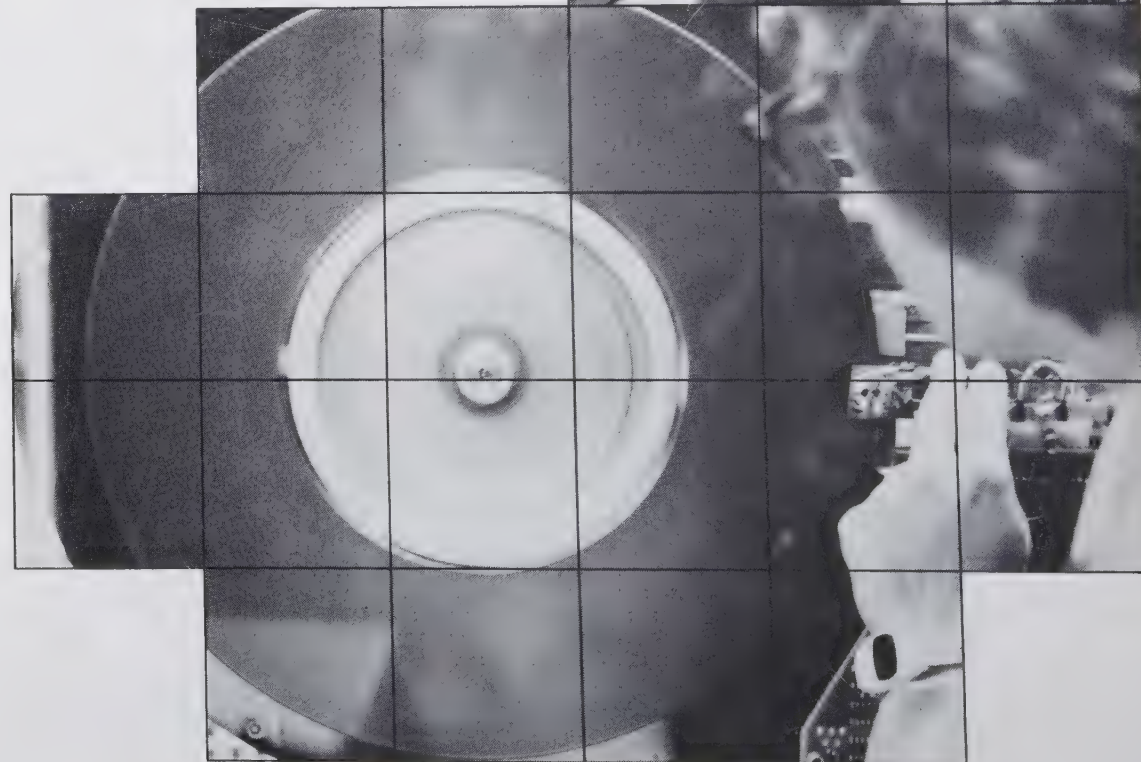
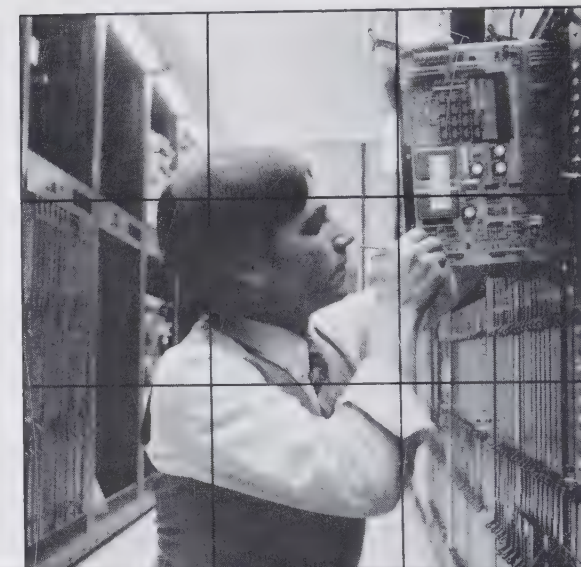
There are two major Northern Telecom companies in the United States. Northern Telecom, Inc. (NTI), headquartered in Nashville, Tennessee, produces and markets telecommunications products and test equipment, and provides telecommunications repair and overhaul service. Most of NTI's customers are independent telephone companies but the company also sells to the operating companies of American Telephone & Telegraph Co. (AT&T), to government agencies and to private corporations and other large institutions. The company employs 5,934 people and operates 14 plants in nine U.S. states and one each in Canada and Brazil.

Northern Telecom Systems Corporation (NTSC), which has 10 manufacturing plants and employs 7,870, is also headquartered in the United States. NTSC's senior executives are headquartered in Dallas, Texas; its computer systems group is headquartered near Minneapolis, Minnesota; its business communications group is headquartered in Santa Clara, California; and its R&D headquarters is in Ann Arbor, Michigan. NTSC also has sales and service operations in Europe, Canada and Australia. It operates manufacturing plants in the Republic of Ireland and the United Kingdom.

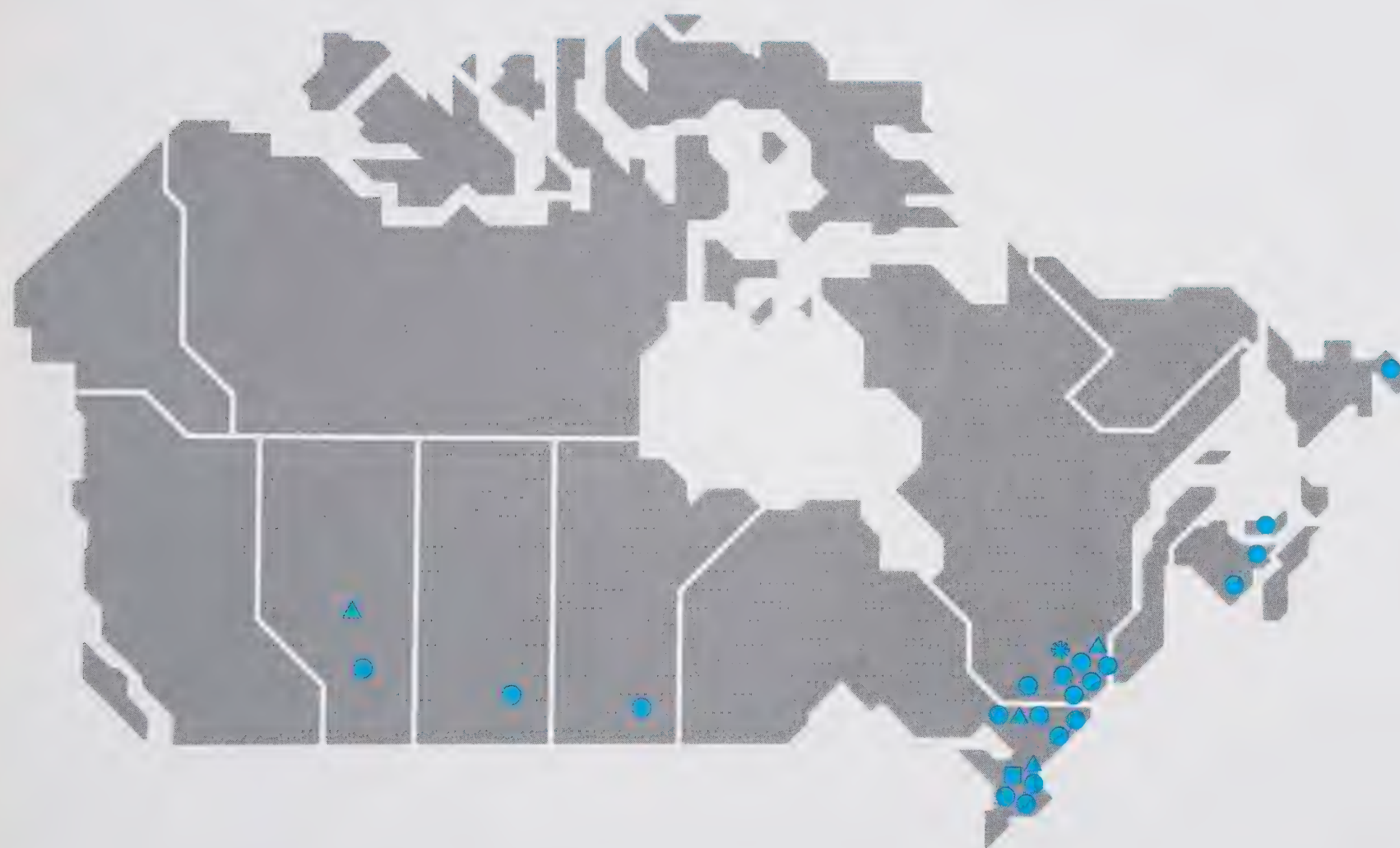
The telecommunications market outside of North America is served by Northern Telecom International Limited (NTIL), headquartered in Toronto, Canada. NTIL is responsible for direct sales of telecommunications equipment as well as for licencing agreements with European manufacturers. It is also responsible for the administration of manufacturing plants in the Republic of Ireland, Malaysia and Turkey.

Highlights of the operations of Northern Telecom companies serving Canada, the United States and regions outside of Northern America are presented on the following pages.

Top: At Brampton, Ontario, inspection of a DMS-100 digital switching system also produced in a new 250,000-square-foot plant in Raleigh, North Carolina. Bottom: Data terminal systems produced by Northern Telecom Systems Corporation can include tape drives (shown in picture), disk drives, printers and other peripheral equipment.



Another successful year ...in Canada



- Corporate headquarters
- Manufacturing: telecommunications equipment
- ▲ Research and development
- ✱ Sales and service company

In 1979 Northern Telecom Canada Ltd. (NTC) and Bell-Northern Research Ltd. (BNR) maintained our position as principal supplier of telecommunications equipment to Canadian telephone companies. Despite intense domestic and foreign competition, the continuing weakness of the national economy, and a lower than expected increase in capital spending by telephone companies, we managed to maintain our share of the Canadian market and increase our manufacturing revenues by 22.5 percent.

Northern Telecom's manufacturing revenues in Canada increased to \$944.8 million in 1979 from \$771.1 million the year before. Of this, \$880.2 million was from sales of telecommunications equipment. The rest was mostly from computer data terminal systems, and research and development contracts with other companies and government agencies.

Revenues from Canadian customers in 1979 represented 49.7 percent of Northern Telecom's worldwide revenues, compared to 59.2 percent in 1978. Sales of telecommunications equipment in Canada were 58.5 percent of worldwide telecommunications sales in 1979 and 67.3 percent in 1978.

Northern Telecom Canada's exports in 1979 were \$227.8 million of completed systems, components, parts and services. These were shipped to

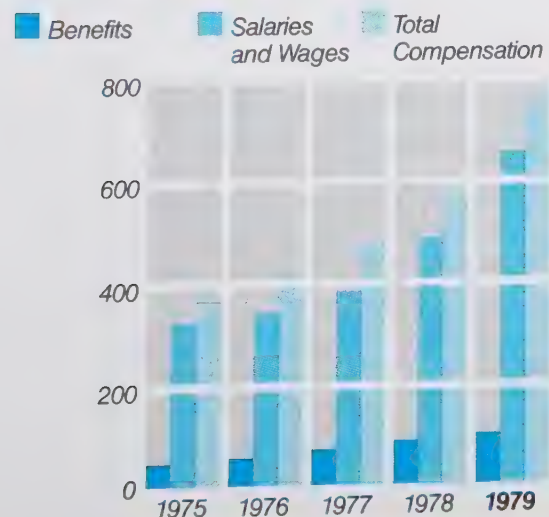
Note: the R&D laboratory in Edmonton, Alta. will open in 1980.

our customers around the world and to other Northern Telecom companies in the United States, Turkey, Malaysia and the Republic of Ireland.

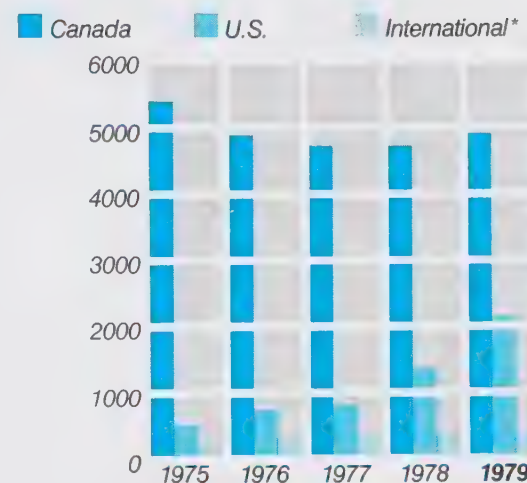
Exports supported some 2,500 jobs in Northern Telecom's Canadian operations and provided an additional several thousand jobs at Northern Telecom's Canadian suppliers.

Although Bell Canada, our largest Canadian customer, bought more equipment from us in 1979 than in any other previous year (more than \$652 million), our sales to this company decreased as a percentage of our total sales. Five years ago, in 1975, 45.3 percent of our sales were to Bell Canada. Last year, in 1979, this percentage dropped to 34.3 percent, an indication of the growth and diversification of our markets.

Benefits vs. salaries and wages (\$ millions)



Plant floor space (thousands of square feet)



*includes NETAS

Most of 1979's increase in Canadian revenues was the result of successful marketing of business communications systems, wire and cable, and subscriber apparatus such as telephone sets and accessories.

The introduction of the DMS line of digital switching and transmission systems designed by BNR, and developed and manufactured by NTC continued on or ahead of schedule.

By year-end, the DMS-10 local switching system had been ordered by telephone companies in six provinces. In September, we received our 100th order for switching systems in the DMS-100 Family, from Alberta Government Telephones, and in December the first DMS-100 was cut into service in Ottawa, Ontario.

Top: Software development at Bell-Northern Research in Ottawa, Ontario. By the mid-1980s software could account for an average of 80 to 85 percent of the development cost of Northern Telecom products. Bottom: Northern Telecom, a leading Canadian manufacturer of communications cable, produces cable in five plants in five provinces.



Northern Telecom's SL-1 digital business communications system, manufactured in Canada at Belleville, Ontario, continued to sell vigorously in 1979. About one third of all SL-1s currently sold or on order are for Canadian customers. Our 1000th SL-1 was installed during the year in Calgary, Alberta.

Also continuing its market success is the Contempra telephone set. In 1979 the Contempra celebrated its 10th anniversary as the first distinctive telephone set designed and produced in Canada. It is now in use in 44 countries around the world.

The success of our products in Canada is due to the combined efforts of Bell-Northern Research, which designs them, and Northern Telecom Canada, which produces them and enhances their design. BNR and NTC work closely with Bell Canada to produce useful products which are in demand in the marketplace.

BNR is Canada's largest industrial research organization. At the end of 1979 it employed about 2,850 people. Northern Telecom's net investment in R&D, about 60 percent of which was carried out by BNR, increased in 1979 by 35.6 percent. It rose from 97.8 million in 1978 to a record \$132.6 million in 1979. About one of every eight Northern Telecom employees makes his or her living directly from R&D. All other Northern Telecom employees are, of course, also dependent on the research and

development program since innovation is fundamental to the future well-being of the corporation.

Another important investment in the future is capital expenditure—investment in systems we lease to our customers and the purchase or rental of additional manufacturing space, new plants and labs, and machinery for production, testing and design.

In 1979 Northern Telecom's total capital investment was \$173.5 million. About half of the investment in plants, laboratories and machinery was in various parts of Canada, where the corporation has invested more than \$300 million in the last 10 years.

The largest investment in a manufacturing plant at Northern Telecom Canada was in Brampton, Ontario where production capacity was increased in 1979 to handle the growing demand for DMS switching systems. The company is also adding to the capacity of its Calgary, Alberta plant for the same reason. This plant is scheduled to begin production of the DMS-100 family of digital switching systems in 1980.

Northern Telecom is expanding its operations in western Canada because the current strong demand for telecommunications equipment in that part of the country will increase in the 1980s. In November 1979, Northern Telecom Canada announced the establishment of a new Business Products Division and the building of a

Our success in Canada is due in large part to the dedication of more than 15,000 employees at Northern Telecom Canada. They cover the full spectrum of occupations, from operators of heavy machinery, to assemblers, software designers, quality inspectors, engineers, and clerical personnel.



new 150,000-square-foot plant in Calgary. The new division will design, market and manufacture telecommunications products for use by businesses. Its product line will include key telephone sets, the SM-1 key system with PBX features, and a new electronic key telephone system to be introduced this year.

In November 1979 Northern Telecom also announced that Bell-Northern Research is establishing a regional research and development laboratory in Edmonton, Alberta. The new laboratory will develop transmission systems, support the new Calgary division by enhancing its products and designing new features for them, carry out development work on new optoelectronic systems, and integrate new technology into the networks of western Canadian telephone companies.

The expansion of Northern Telecom's operations in western Canada is expected to create more than 1,000 new





jobs by 1984. These will be in addition to the new jobs that will be created when Northern Telecom completes negotiating and implements its announced intention to expand operations in Saskatchewan, Manitoba, and other parts of the country.

One of the largest single elements of the corporation's Canadian expansion program is a plant in Ottawa, Ontario. The 105,000-square-foot facility, also announced in 1979, manufactures proprietary LSIs (Large Scale Integrated circuits) and is responsible for continued design and development of these critical components. This facility, which will have a total investment of \$36 million, and its sister plant under construction in Rancho Bernardo (near San Diego), California, will supply 60-to-70 percent of the custom LSIs used by other Northern Telecom plants in North America.

Northern Telecom's large investment in new facilities, machinery, and research and development enables us to produce more and better products. But it also contributes substantially to the improvement of our productivity and, therefore, to our competitiveness. In 1979, for example, Northern Telecom Canada increased its productivity by 10.5 percent and exceeded the targets it had set for cost-reduction. As a result, in spite of large increases in the cost of materials and components average net price increases for its products were 6.1 percent, well below the rate of inflation in Canada.

Since the organization and structure of a company are also important contributors to its competitiveness, a number of structural changes in our Canadian operations were made during 1979. Early in the year, for instance, Northern Telecom Canada's Outside Plant Division was transferred to the Wire and Cable Group which reports to André J. Boutin. The Optical Systems Division became part of the Transmission Group which is headed by David G. Vice. A new Service Business Unit was formed in the Switching Group to provide faster, more efficient service to telephone companies which buy Northern Telecom switching systems. And, B-N Software Research Inc. became a subsidiary of Bell-Northern Research Ltd., in order to provide better coordination and direction of the research and development activities of the Northern Telecom family of companies.

In summary, the success of Northern Telecom's Canadian operations in 1979 was due to many factors: a high level of capital investment; a strong commitment to research and development resulting in superior products; an intensive marketing effort; the expansion and strengthening of corporate structures; commitment from the more than 18,500 Northern Telecom employees across the country; and, the continued determination and careful planning on the part of management and supervisors at all levels. ■

Another successful year ...in the United States



- Corporate headquarters
- Manufacturing: telecommunications equipment
- ▲ Research and development
- ⊙ Manufacturing: electronic office systems
- * Sales and service company

Note: manufacturing plants at Rancho Bernardo, Cal., Mt. Laurel, N.J., and Raleigh, N.C. are under construction.

Northern Telecom's operations in the United States were characterized in 1979 by change and continued growth. Both of the corporation's major U.S. subsidiaries—Northern Telecom, Inc. (NTI) and Northern Telecom Systems Corporation (NTSC)—increased their revenues, realigned their organizational structures and strengthened their manufacturing operations. BNR Inc., which designs and develops telecommunications products and systems primarily for the U.S. market, increased its staff, expanded its facilities and introduced new enhancements for Northern Telecom products.

Northern Telecom's revenues in the United States in 1979 were \$754.7 million, or 39.7 percent of the revenues of the whole corporation. In the previous year, 1978, revenues in the U.S. were \$483.1 million, or 32.1 percent of the total.

About 70 percent of our 1979 U.S. revenues were from sales of telecommunications equipment. These represented about 35.5 percent of the corporation's worldwide sales of telecommunications equipment, compared to 27.5 percent the year before.

The other 30 percent of our U.S. revenues in 1979 were from sales and leases of electronic office systems. NTSC's total revenues from electronic office systems—in Europe, Canada,

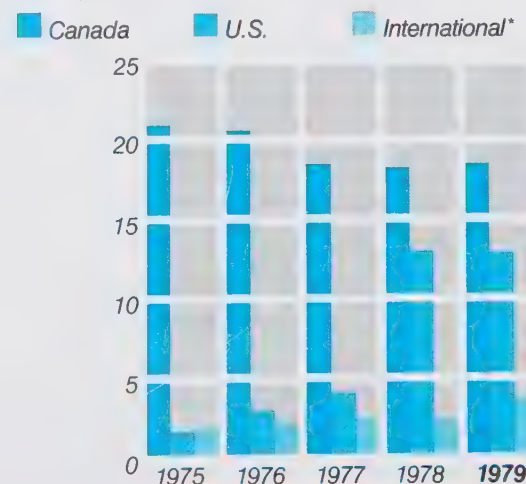
Australia and other parts of the world as well as the United States—were \$349.8 million, or 18.4 percent of all Northern Telecom revenues in 1979.

Northern Telecom, Inc. sells to telephone companies, specialized telecommunications carriers, and to large corporations and other institutions which have their own communications networks. Its product portfolio includes central office switching systems, transmission systems, subscriber apparatus, outside plant products, data transmission test equipment, private network switching systems and other telecommunications products and services. Although several of NTI's groups and divisions—including Cook Electric, Spectron, Danray and Northeast Electronics—contributed to its success in 1979, much of NTI's growth in 1979 was due to its successful marketing of Northern Telecom's DMS family of digital switching and transmission systems. An example is the success of the DMS-10 small local digital switching system.

The first DMS-10 was put into service in (October) 1977. In September 1979 the 100th DMS-10 was put into service in East Dubuque, Illinois by the Northwestern Telephone Company. By the end of 1979, DMS-10 systems had been sold to or ordered by U.S. telephone companies in 39 states and 141 DMS-10s were in service, of which 126 are in the United States.

In November 1979 American Telephone and Telegraph (AT&T), the world's largest telecommunications company which serves more than 135 million U.S. telephones, recommended the DMS-10 to its 23 operating subsidiaries. AT&T advised them to include the DMS-10 in application studies for replacements and new systems up to 4,000 lines in community dial offices. There are about 4,800 such offices in the AT&T system.

**Total number
of employees**
(thousands)



*includes NETAS employees

In February 1980, AT&T followed-up its recommendations by signing a three-year supply contract with NTI. The first of the DMS-10 systems covered by this agreement will be shipped in June 1980.

In 1979 Northern Telecom, Inc. also signed two-year supply agreements for DMS equipment with the fourth, fifth and sixth largest telephone companies in the United States. In respective order, Continental Telephone Corporation agreed to buy US\$50 million of DMS equipment, Central Telephone and Utilities (Centel) agreed to buy US\$50 million, and Mid-Continent Telephone Company signed a US\$25 million contract.

Another milestone in the success of the DMS family was the placing into service, in April 1979, of the first DMS-200 long-distance switching system in the U.S. It was purchased by Continental Telephone of Virginia and installed at Warsaw, Virginia.

While NTI sells primarily to telephone companies and other common carriers, NTSC sells and leases information-processing equipment to private businesses, government agencies and other institutions which own and operate their own information processing systems. It supplies them with business communications systems, data terminal systems and related peripheral equipment such as printers and disc drives.

In 1979, NTSC's first full year of operation, the company made significant progress towards offering a product line of fully integrated private information systems. Northern Telecom's Business Communications Group headquartered in Santa Clara,

California was transferred from NTI to NTSC. The division produces Northern Telecom's SL-1 business communications system and other PBX (private branch exchange) systems such as Northern Telecom's Pulse electronic PBX for the U.S. market.

As a result of this realignment NTSC now offers its customers two of the fundamental components of the so-called office of the future: multi-function data terminal systems and digital private branch exchanges. Northern Telecom's researchers, at NTSC and at other Northern Telecom companies, are developing and enhancing each of these critical systems components. In 1979, for instance, Northern Telecom announced a new data feature for the SL-1. Using the new Add-On Data Module, owners of SL-1 systems can route digitally encoded information between computers and terminal systems at high speeds. Because the information does not have to convert to analog form for switching purposes and back again to digital form at its destination, the transfer of information is quicker and less expensive. It does not require additional wiring since voice communications and data transmissions travel through the same system.

Other enhancements during the year include a message-center capability and custom-designed circuitry for use of the SL-1 in hotels and motels. These enhancements and the others an-

nounced in 1979 contributed to the widespread market demand for our electronic communications and data-processing systems in the U.S. market. At the end of 1979 almost 1,100 SL-1 systems had been sold or on order in the U.S. alone. More than 700 Model 445 systems were operating in 12 countries.

Northern Telecom's evolving product line and its growth into new markets has necessitated organizational change and realignment in its U.S. operations. In 1979 much of the change involved the building of new manufacturing and R&D facilities and the expansion of existing ones. About half of Northern Telecom's capital investment in plants and equipment in 1979 was in the U.S.

During the year a new 70,000-square-foot plant was built in Mt. Laurel, New Jersey by NTI's Spectron Division which produces test and control equipment for electronic data transmission. A 140,000-square-foot transmission plant was opened in Atlanta, Georgia. NTSC opened an 85,000-square-foot R&D facility, which houses Northern Telecom's U.S. data center, in Ann Arbor, Michigan. A new 80,000-square-foot plant in Morrisville, North Carolina started production of DMS equipment. DMS administrative offices were consolidated in a 70,000-square-foot facility

in Raleigh, North Carolina, and construction was begun on a 250,000-square-foot DMS switching plant in the same city. In Santa Clara, California work was started on increasing by 70,000-square-feet the production capacity for business communications systems. And, in Mountain View, California work was started on a new 162,000-square-foot R&D facility for BNR Inc. A new 50,000-square-foot plant for the manufacture of custom LSIs (Large Scale Integrated circuits) in Rancho Bernardo, California, was also announced in 1979.

Northern Telecom's capital investment program was coordinated with a number of organizational changes in 1979. Several departments, company divisions and groups in the Northern Telecom structure took on new responsibilities. This reorganization and expansion of U.S. operations caused some stress on the organization and its resources. But capital investment and realignment of responsibilities, combined with substantial investment in research and development, are crucial to Northern Telecom's continued success. In a business enterprise, as in personal life, change and growth are an investment in the future. ■



Above: Northern Telecom, Inc. signs its historic agreement to supply DMS-10 switching systems to AT&T telephone companies. Right: The Spectron Division of NTI produces leading-edge telecommunications test equipment in Moorestown and Mt. Laurel, New Jersey.

Another successful year ...in international markets



- Corporate headquarters
- Manufacturing: telecommunications equipment
- Manufacturing: electronic office systems
- * Sales and service companies

Northern Telecom continued in 1979 to successfully market telecommunications equipment and electronic office systems in Europe, Asia, the Middle East, the Caribbean and other parts of the world. Revenues from sales and leases of our equipment outside North America were \$201.5 million. These international revenues were 10.6 percent of the corporation's total revenues in 1979, compared with 8.7 percent in 1978.

In 1979 Northern Telecom International Limited (NTIL) sold and received orders for subscriber apparatus, business communications systems, digital switching and transmission systems, and other telecommunications equipment from customers in 70 countries. Northern Telecom Systems Corporation sold and leased data terminal systems and peripheral equipment such as printers and disc drives to customers in 37 countries.

Sales of telecommunications equipment outside North America were \$90.3 million, or six percent of all telecommunications sales, up from 5.2 percent in 1978.

The fastest growing international demand for telecommunications equipment was for Digital World products—digital switching and transmission systems, and digital business communications systems. In December 1979 the government of

South Korea announced that NTIL was the successful bidder for a three-year contract for the supply of digital transmission systems. This is one of the largest export contracts ever signed by Northern Telecom and could result in sales of \$90 million. Orders will be filled by Northern Telecom Canada's manufacturing plants in Aylmer, Quebec and Winnipeg, Manitoba.

The SL-1 digital business communications system was sold in 1979 in six Middle Eastern countries. Two 3,900-line SL-1 systems were sold in Saudi Arabia. Nine SL-1 systems were ordered by Jutland Telephones in Denmark. By the end of the year, nearly 180 SL-1s had been sold or on order in 21 countries outside of Canada and the U.S.

The SL-10 digital data packet switching system also enjoyed international market success in 1979. Deutsche Bundespost, the West German postal and telecommunications authority, for instance, ordered 26 SL-10s in 1979 after buying its first one the year before. Three other SL-10s were sold in 1979 to the largest bank in Belgium, the Société Générale de Banque.

International demand for DMS switching and transmission systems continued to grow in 1979. DMS-100 local digital switching systems, were ordered by Barbados and by the Grand Bahamas Telephone Company. Barbados also ordered 10 DMS-1 subscriber carrier systems, and three DMS-10 small local switches.

DMS-10s have been sold to or ordered by telephone companies in five other countries. An international version of the DMS-1 became available in September 1979.

Northern Telecom's subscriber apparatus and other telecommunications equipment also continued to sell briskly around the world in 1979. The Hong Kong Telephone Company, for instance, placed an order for the stylish Contempra telephone set which is now in use in 44 countries. Greece ordered crossbar central office switching equipment for its national telephone network.

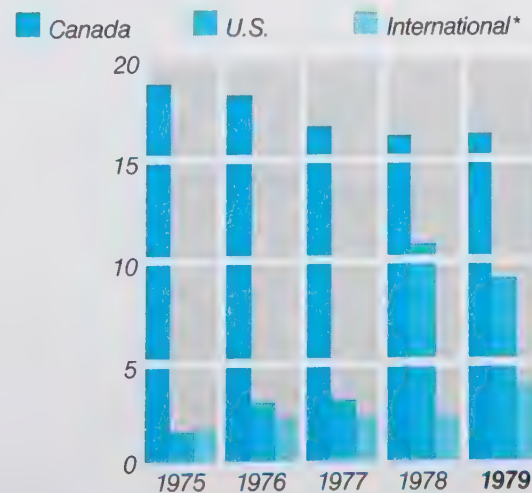
The success of Northern Telecom Systems Corporation in world markets is measured by the fact that 34 percent of its 1979 revenues were from outside North America. At the end

of 1979 there were 700 Northern Telecom Model 445 clustered data terminal systems in operation in 12 countries. NTSC serves its customers through 352 sales and service offices in the U.S. and 13 other countries. It operates 10 manufacturing plants, two of which are in England and the Republic of Ireland, and employs 7,870 people.

Northern Telecom International directs the work of 2,494 employees in its European, Asian, Middle Eastern and Caribbean sales offices and in the manufacturing plants it administers in Turkey, the Republic of Ireland, and Malaysia.

Northern Telecom International and Northern Telecom Systems Corporation carry throughout the world our reputation as one of the largest and most respected suppliers of telecommunications equipment and electronic office systems. They are international ambassadors of Canadian and U.S. technological know-how. ■

Employees in manufacturing subsidiaries
(thousands)



*includes NETAS

Top: Installation of a DMS-10 digital switching system in Barbados. One of our largest international customers, Barbados has also purchased DMS-1 and DMS-100 systems. Bottom: Parts and components made in Penang, Malaysia are shipped to plants in North America.



Who's in charge here? a look at our managers

In a high-technology industry such as Northern Telecom's, the quality of management, at every level, is key to a corporation's success. Whether the field is research and development, production, marketing, human resources or finance, the caliber of management is critical.

Managing in a corporation which creates change through innovation is more of a challenge than in a firm whose product or service is constant. Keeping up-to-date on current developments is exacting. Being able to reorganize activities to promote kaleidoscopic new arrangements is a demanding, constant and occasionally frustrating requirement.

From senior executive to production shop supervisor, the manager's decisions are the interlocking building blocks on which the success of the corporation rests. With each new development, the links between managers have to be reorganized. Like interlocking blocks, the activities of one manager have to match those of his counterparts on all sides. One activity, like one block, that does not correspond can affect the ability of others.

At Northern Telecom managers are a diverse group. This makes their interactions all the more important.

Numbering about 4,250, Northern Telecom's managers wear a variety of titles such as vice-president, director, administrator, manager or supervisor.

They are collectively responsible for the management and direction of the Northern Telecom companies which employ a total of more than 35,100 employees in 56 manufacturing plants, nine research and development labs, and more than 350 sales offices and other facilities.

Whatever his or her particular job title, every manager shares common functions. Whether the decision is on hiring an employee, approving a company budget or conducting an experiment, every manager has to analyse information, make a decision, and act to implement the decision.

A statistical profile shows the typical manager in Northern Telecom is a male, 34-years-old, who has been with the corporation or one of its subsidiaries for about four years. He has a university degree in science, and has worked at some other company for three to four years, before joining Northern Telecom.

Within the corporation, the manager's relationship with his subordinates is one of the most important aspects of his job. On average, he supervises about seven people.

The way a manager deals with these people is important to the corporation as well as the individuals. To a significant extent an employee's sense of satisfaction with his job and his loyalty to the company arises from his estimate of whether he is well managed.

At Northern Telecom a manager is responsible for helping his employees

develop their skills and potential. He does this through instructions, training, compliments, encouragement and judicious criticism. He frequently explains why he is asking an employee to do something, as well as saying what to do and how. Being a good manager also means listening to observations his employees make.

As this suggests, communications are important to a manager. He deals with a wider number of people more frequently and uses more communications tools than do non-managers. This means sending and receiving more memos, telephone calls, telexes or facsimile copies, and going to more meetings and having visitors more often.

The typical manager's heaviest communications traffic is inside the Northern Telecom family of companies. He draws information, services and advice from a wide variety of people related to whatever tasks he is engaged in. Most frequently he sends the product of his activity primarily, if not exclusively, to other managers inside Northern Telecom.

The variety of communications tools and internal correspondence a manager uses also reflects the many roles he plays. At times a single manager acts as a skilled specialist, working on an engineering problem.



At other times he is a generalist doing budget planning for his program or conducting performance reviews with his staff. He might also be a member of a management team looking at a plant-wide or company-wide issue. Each of these various functions creates its own communications flow.

If someone took a large organization chart and drew a line from any four or five managers to all the other people with whom they communicated during a week, the lines would scatter everywhere.

Here the idea of the typical Northern Telecom manager breaks down. The lines between the various managers on the chart represent very different kinds of information. To consider all managers as the mythical person created out of statistical profiles ignores rich variations in age, experience, function and culture. Very different information needs accompany these variations.

In Northern Telecom Canada (NTC), for instance, the average age of managers is 45. Most of these people have worked in the company or its predecessors for an average of 22 years.

The biggest single group—almost 20 percent—of NTC managers works in manufacturing. The next two groups in size are marketing and engineering—about 15 percent each. This reflects

NTC's role as an established supplier of advanced products to a market with relatively few customers and to other Northern Telecom companies.

At Northern Telecom Systems Corporation, on the other hand, the average manager matches the company age profile of 34, but he is more likely to work in marketing and have less than two years experience with the company and its predecessors. NTSC is a newer company which markets relatively smaller systems to a market which includes a much greater number of customers.

On another dimension, at Bell-Northern Research the typical manager has at least one post-graduate degree.

Throughout the company, women managers appear to be a growing group. They are most likely to be in their late 20s and have about three years of service in the company. They are also slightly more likely to have an advanced degree than their male counterparts and are about four times more likely to work at Northern Telecom, Inc. than at Northern Telecom Canada.

The notion that the average manager supervises about seven people also requires qualification. At executive levels, one senior manager will supervise several other management personnel. In manufacturing plants, on the other hand, a single manager may have 20 or more individuals in a direct reporting relationship. These variations in numbers create different

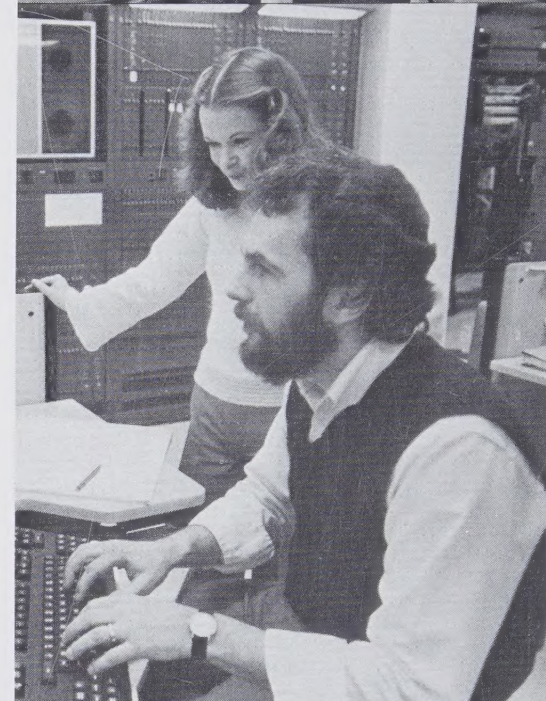
requirements for a manager's time, his talent for dealing with people and, probably, the information he will need.

Having talked about how managers are typical and how they are diverse, what does it mean?

The statistical picture reflects a young company with deep roots. It also shows that Northern Telecom has earned the loyalty of many of its managers. Continuity of this trend should mean simultaneous consolidation of managerial talent while the company continues to grow.

It is no accident that Northern Telecom is an industry leader. Our successes in the last decade have shown that the company has imaginative, dedicated management. The challenge of the 80s will be to integrate and expand the leadership. The profile shows that the ingredients to do it are there. ■

Top: Jim Schmitt, production manager at the Advanced Telephone Products Division in Nashville, Tennessee. Middle: Bruce Galt, manager, DMS business services at BNR in Ottawa, Ontario. Bottom: René Lauzon (left), manager, telephone apparatus department at the repair and overhaul plant in Montreal North, Quebec with section manager Paul Jolicoeur.



Telesis: a window to our world

Telesis is a window through which the international telecommunications community witnesses the creation of the market-leading technology that backs Northern Telecom products. **Telesis** is the technical magazine of Bell-Northern Research Ltd. (BNR), Canada's largest industrial research organization and one of the most respected in the world.



Published bimonthly and distributed free, **Telesis** is read by about 50,000 people in 70 countries.

Telesis is, in part, a very special marketing tool. It is not a hard sell, but it is hard information. It complements

Northern Telecom's marketing strategy by tutoring potential buyers and the telecommunications community in general. It gives its readers a technological context in which to see Northern Telecom's products.

An estimated one third of **Telesis** readers do not have technical backgrounds. **Telesis** readers range from telephone company presidents and manufacturers, to scientists, engineers and technicians, to students and teachers, government officials and journalists.

Daily, **Telesis** receives requests for subscriptions or back issues from around the world. A common sight in the **Telesis** office at BNR is the mailbox loaded with bundles of letters bearing the bright colorful stamps of the many countries the magazine reaches. Canada accounts for nearly 50 percent of its readership, the United States for 35 percent, and Europe for much of the remainder.

Telesis has chronicled the multidirectional progress of BNR since 1967, discussing everything from the design of the sleek and versatile Contempra telephone, to the design and enhancement of the SP-1 electronic switching system, to the dawn of Northern Telecom's 'royal family' of DMS switching and transmission systems.

Northern Telecom cable transmission systems, as well as optical fiber, satellite and terrestrial microwave

The business of innovation

We've come a long way since the Nemco battery

Don Chisham

Innovation is a way of life for the Bell Canada group. And it has been that way for decades. The results are evident in the five years that Bell Canada telephone users have today and in the availability of new systems and services, many of which are far in advance of the rest of the world. This article will explore the innovative process within the Bell group — from its modest beginnings in the 1800s to today's advanced research and development. Some of the innovations themselves will be discussed, as will their role in making the Bell group one of the most successful telecommunications organizations in the world.



systems, have also been outlined by the engineers and scientists who began with rough-cut concepts and drawings in the lab and ended up with full-blown sophisticated telecommunications products. An identifying mark of **Telesis** is the sketched portraits of these engineer-authors.

From Ottawa to Hong Kong, Chicago to Istanbul, **Telesis** makes people pay attention to Northern Telecom. Other technical magazines often reprint **Telesis** articles. A **Telesis** article on Northern Telecom's FA-1 optical fiber system was recently printed in a widely-read Canadian electronics magazine and translated for a Hong Kong-based quarterly.

The pages of **Telesis** also highlight customers' experiences. In 1979 **Telesis** devoted a special issue to network planning techniques developed cooperatively by BNR and Bell Canada. The issue was reprinted because of great demand for copies.

Research in the fields of seeking a better understanding of how the world around us works. Curiosity-driven, its goal is understanding and it leaves to others the application of that understanding. Development is more driven. Although it is open to new understanding, its primary focus is design intended to be applied for commercial purposes.

The Bell Canada group's interest in R&D is complemented by the marketing activities of Bell Canada and Northern Telecom. Marketing and R&D drive the innovative process, that set of disciplined activities involving marketing, personnel, operations, production, sales, distribution and service groups. R&D is also the responsibility of the Bell Canada group to guarantee the continuous delivery of advanced technology products and services. Some of the products to market driven, the resulting innovations have enjoyed a high degree of success in the field.

Telecommunications is one of the most innovative of scientific fields, responding to a range of human needs. These needs change dramatically over the years, requiring creative minds to change the technology that serves them. New systems and services have emerged each year since Bell Canada began in 1800, bringing with

them important social changes and advances. The most new systems were developed not by a general process, but by engineers, production people and craftsmen — individuals who spent their skills, experience and ingenuity to solve problems they encountered on the job.

Even though Bell Canada prospered virtually all its new technology until the 1950s, some research was sometimes undertaken, even in the last century. For instance, in the 1890s, Charles Sise, Bell Canada's first vice president, set up a laboratory in the basement of the Montreal Electric Building. The objective was to develop a reliable and practical way to use batteries as a power source for the new telephone system. Unfortunately, the telephone system was not successful, and the telephone system was not successful, and the telephone system was not successful.

Even though Bell Canada prospered virtually all its new technology until the 1950s, some research was sometimes undertaken, even in the last century. For instance, in the 1890s, Charles Sise, Bell Canada's first vice president, set up a laboratory in the basement of the Montreal Electric Building. The objective was to develop a reliable and practical way to use batteries as a power source for the new telephone system. Unfortunately, the telephone system was not successful, and the telephone system was not successful, and the telephone system was not successful.

Growing independence

The innovative process within the corporate group has come a long way in the last century and especially in the last two decades. Prior to the 1950s, Bell Canada's technological development was largely dependent upon the availability of products and designs from the US Bell system. Bell Canada and Northern Telecom did have their own engineering staffs but they were primarily engaged in solving Western Electric's design to Northern Telecom specifications and Bell Canada conditions. The 1950s saw the transition from dependence to independence in engineering staffs and in the US Bell system. It became necessary not only to develop which products to market and when, but to develop their successful development, implementation and introduction. The goal was — and still is — to produce high performance products which are cost-effective for the customers, while still generating earnings for the investor group.

Large innovation, which can be spontaneous and accidental and is often the result of a single individual's efforts, the innovative process is a managed systematic process that which is a systematic order and market oriented. It requires detailed engineering.

With the coming together of computers and telecommunications, technology is affecting the lives of more and more people, both in the home and on the job. **Telesis** is broadening its scope to reflect the impact of this telecommunications revolution. In future, the magazine will be aimed at an even broader readership and will include more features and interviews with technology's decision makers. It will provide a clearer understanding of the direction communications technology is taking.

The origin of the word 'telesis' is Greek. It means progress intelligently planned and directed. In industrial research and development, the end is useful, economically produced products. And this is where the partnership between BNR and Northern Telecom excels. A bimonthly glimpse at BNR's intelligently planned progress is available from: Bell-Northern Research Ltd., Dept. 8E50, P.O. Box 3511, Station C, Ottawa, Canada K1Y 4H7 ■

